# THE IRON TRADE REVIEW

Single Copies 15 Cents | CLEVELAND, JULY 12, 1917 | Four Dollars a Year

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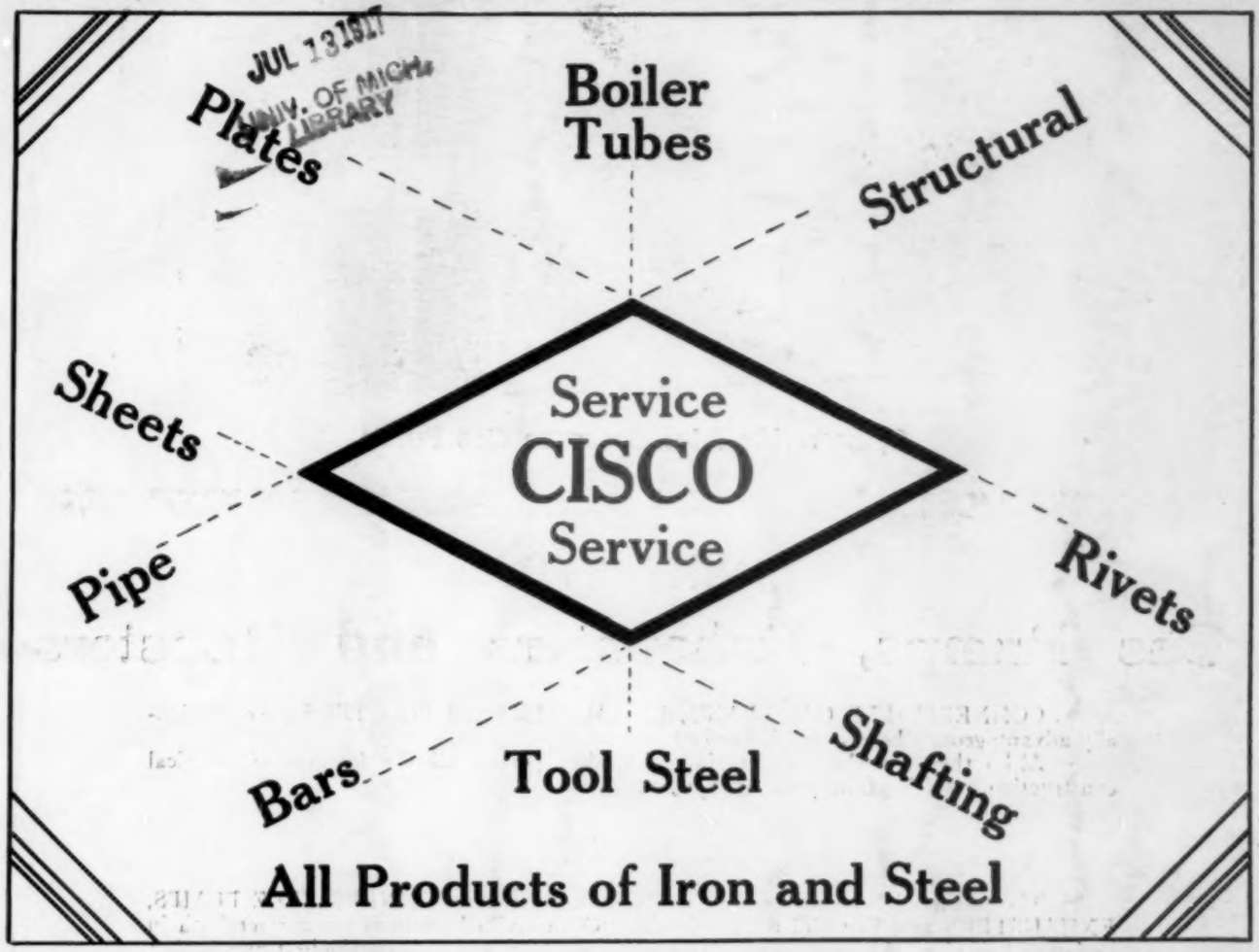


**Just as CINCINNATI, the Queen City, is the Central Gateway to the South, the Middle West and the Central States, so is**

## THE CINCINNATI IRON AND STEEL COMPANY

**the natural market for all buyers in those parts.**

An ***immense*** stock, constantly ***replenished,*** of ***anything*** you may ***need*** in iron or steel; a ***large*** force of men to intelligently handle it—Shears, Punches, Saws, Benders, Cranes, Electric Hoists all ***especially*** equipped to cut to length any size or gauge desired—Five Motor Trucks to ***RUSH*** all Material to the depots where Cincinnati's Package Cars give ***Express Service*** at ***Freight Rates***—These are a ***Few*** of the Reasons.

**Every Customer is a Valued Friend of CISCO.**

**Many Customers are Life Long Friends of CISCO.**

WE WANT YOU AS A FRIEND.

**PHONE—(Private Exchange West 1696). WIRE—(Direct Western Union and Postal Lines). OR WRITE US.**

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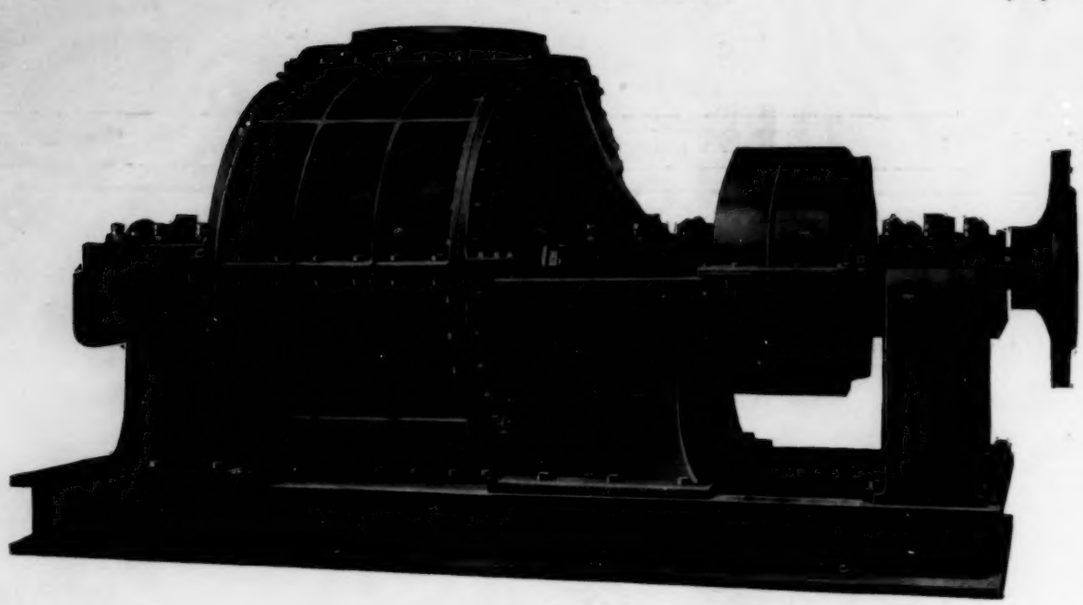

**Connersville High Pressure Gas Pump**


## CONNERSVILLE

# Gas Pumps, Exhausters and Boosters

CONNERSVILLE GAS PUMPS, EXHAUSTERS and BOOSTERS are exceptionally advantageous wherever gas is handled.

Altho they are the type of simplicity, they possess all the features of practical construction, resulting from years of experience.

## CORRECT

The testimonials which we have received from users of CONNERSVILLE PUMPS, EXHAUSTERS and BOOSTERS, prove that "Connersville" products are correct both in design and service. Many state that they out-work as well as out-last the best pumps that they have ever been able to obtain.

## EFFICIENT

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The service to which CONNERSVILLE PUMPS, EXHAUSTERS and BOOSTERS can be put, is almost unlimited. They can be used for handling air, gas, steam, water and all other fluids.

These pumps may be driven by belt, by direct connected steam engine, by electric motor direct connected or through gear and pinion, or by silent chain.

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# THE CONNERSVILLE BLOWER CO.

**CHICAGO**
**929 Monadnock Bldg.**

**CONNERSVILLE, IND.**

**NEW YORK**
**114 Liberty St.**

THE IRON TRADE REVIEW

*Vol. LXI* Cleveland, July 12, 1917 *No. 2*

# Federal Action Overhangs Market

**Conservative Policies Generally Being Followed as Proposals For Greater Federal War Supervision Over Industry Remain Unsettled—Buying and Selling Falls into Waiting State—Some Prices Are Lower**

AS INDICATIONS from Washington point to the probability of early action of some kind in the many proposals for better co-ordination of war relations between government and business, a sentiment of marked conservatism has seized upon the iron and steel industry. Buying and selling has become further restricted almost to dullness and this condition strangely contrasts with the many months of seemingly limitless market activities of the recent past. The disposition of the entire trade is to wait upon further and definite information regarding the government's plans before incurring further obligations. The reaction from tense to easier conditions generally is regarded as a wholesome and salutary development.

**Conference on at Washington**

Members of the general iron and steel committee of the American Iron and Steel Institute are in conference at Washington at the request of government officials and it is thought likely some important action may be the outcome. The proposal to create in place of the numerous committees a war board of few members, to which the President will delegate some of his wide powers for dealing with the iron and steel and other business enterprises is receiving more serious attention. The government is manifesting a desire to avoid any action of a drastic character and to settle the problem of price and tonnage determination by close co-operation with the manufacturers.

**Pig Iron Grows Dull**

Pig iron has quieted down on all sides and is virtually dull. Consumers are less inclined to consider purchases while the present uncertainty regarding price regulation prevails. Producers, on the other hand, with large order books, are welcoming a chance to catch their breath after the high-gear movements of the recent past. The market throughout has a more wholesome appearance. The slowing down of buying has given rise to some reports of price easiness, especially in bessemer, which has been offered well under the present market. Generally a firm condition prevails. In some quarters, notably in the east and at Buffalo, individual advances continue. Lake makers have named $60, furnace, for first half foundry. In the south, producers have named a price of $48 for delivery during the last half of 1918. No further sales for that period have developed in any district. The average price of iron now being shipped from the south is placed at well under $30. One seller has been offering last half iron at $45. Export business in pig iron is held up pending a clearer understanding of the conditions obtaining under the new embargo act. It is pointed out, however, that since much of the selling of the past has been to the allies of this country, the total movement is not likely to be much affected and it may be expedited to Italy and France at the expense of neutral nations.

**Scrap and Coke Drop**

Drooping markets have developed in scrap and in coke. In old material, the reaction from the phenomenal peak of prices is well under way. Prices are lower this week and consumptive buying has fallen to a slow gait. The market is described as the quietest of the year. Spot coke has had a rapid reverse movement, as the expected loss of production over the Fourth did not materialize, due to a considerable extent to the abrupt action of the court in closing the saloons for the holiday. Improved car supply, which now is around 75 per cent, also is a factor in the weaker market. Spot furnace coke has come down $4 in a few days and is at $12.50, ovens, or lower. A large block of furnace coke was contracted for for the first half of next year at $10, ovens. In certain localities, however, the market still shows great strength. At Chicago, byproduct has gone higher and $20 is reported. Alabama furnaces have been inquiring in that territory. St. Louis also has been receiving requests for fuel from producers who never before appeared there. These inquiries are estimated at 50,000 tons.

# THE OPEN HEARTH

## Equal War Taxation is Industry's Due

MEN, money and munitions form the alliterative trinity of essentials in modern warfare. Each must be provided and distributed freely, but the highest science of military management demands that in doing so the maximum supply of any one of these major factors shall not be impaired. This involves the adoption of careful methods insuring the equal apportionment of the burdens as well as the trained skill for carrying on the war. Universal conscription, the discriminating division of man power between duties on and behind the battle line, and the balancing of war and non-war trade to sustain initiative and normal business as far as possible are justified and explained on this principle.

The proposed form of excess profit taxation now before the senate violates in several important particulars this fundamental law of equal distribution of war's exactions and the safeguarding of enterprise. It arbitrarily selects the three years immediately preceding the war as the basis for computing an average year's earnings today without regard to the changed fundamental conditions that undoubtedly have come about since that time. There is no certainty that what were fair and good earnings in 1913 or 1912 would be equally fair and good earnings in 1917. But having set an arbitrary standard above which, after certain exemptions, the socalled excess profits begin, the measure when applied leads into absurdities. Under its provisions, a company, no matter how large, which was uniformly prosperous in the prewar years and since, and hence is amply able to pay, may escape with little or no taxation while another in poor or moderate circumstances before the war is to be taxed heavily because it is getting on its feet financially whether or not the betterment has been due to the war. Furthermore the burden of the tax must be borne by the corporation, large and small, and by the manufacturing industries chiefly, while the farmer and the small business man gets off.

The theory of taxing profits created by a country being at war is sound. The situation in the United States, however, differs from that in England where a straight profits tax is being imposed. Present profits of the iron and steel industry are not due to the United States being at war, but rather in spite of it. They are founded on business and conditions created by the remarkable foreign demand of the past three years.

The money for fighting must be provided. The iron and steel and allied industries welcome the opportunity to do their full share. But if their war profits are to be taxed heavily all war profits should be treated accordingly. There should be equality in all lines of trade and industry. The proposed senate bill is discriminative and therefore unfair. It should be amended.

## Keep Legitimate Business Moving

MANY mills, fabricators and manufacturers are refusing to accept ordinary business contracts because of the desire to reserve capacity to meet possible government demands for war materials. Repeatedly the requirements for steel, for example, have exceeded by far the original estimate of not over 5 per cent of the mills' capacity, but the demand has not been so enormous that it warrants a hysterical cessation of all regular business. Reports of contractors which indicate that only 5 per cent of the normal building is being done at the present time. Much of this slump no doubt can be attributed also to the high cost of construction. The war has placed an unprecedented strain upon the country's industries and every means must be taken to facilitate the shipment of supplies to its allies and to satisfy its own army and navy program. But this must be accomplished without destroying the efficacy of the vast commercial and industrial machinery which is the backbone of the nation.

One of the greatest factors necessary to insure the power of a nation to wage protracted warfare and to win final success, is general internal prosperity. The normal expansion of many industries has been handicapped since the outbreak of the European conflict and now, when the effect of this restriction promises to become increasingly serious, those desiring to make up for lost time are hampered by preferred lists which recognize only government wants. Business cannot be as usual, but business must be kept good. It is meritable that commercial readjustment must take place when a nation is plunged into war. Let this movement be so directed, however, that it shall foster, if possible, and maintain surely, rather than stifle the expansion of legitimate industries.

## Delays Jeopardize Nation's Interests

UNTIL men directing the affairs of the nation stop calling for a new deal and lay their hands upon the table, business will continue to slow down all along the line. Domestic consumers of finished steel commodities, such as plates, shapes and bars, summarily withdrew from the market, when the United States entered the war; since that time, they patiently have awaited developments at Washington, attempting to ascertain how much tonnage will be available for domestic consumption after the nation's needs have been satisfied. The coal trade was thrown

# THE OPEN HEARTH

into great confusion, from which it has not recovered, when one member of the President's cabinet branded as exorbitant the proposed price on coal accepted as fair and reasonable by one of his colleagues.

Proposed price regulations and market restrictions appear to be responsible for a slump in the market for scrap, prices of which have tumbled several dollars a ton the last week or 10 days. The general situation has been complicated further by petty squabbles over prices of ship plates, aluminum and other commodities, the need for which is urgent, from a military standpoint. No one seems to know how much of the proposed merchant fleet will be built of steel or wood. Moreover, the fate of John Barleycorn still rests with the jury.

The end of the war will not be in sight until our program of aggression is well under way. Our European allies, particularly the French, are crying for help. We are not contributing to the cause by engaging in verbal pyrotechnics at Washington. Leaders of the iron trade insist that our industrial resources are sufficient to meet demands of the nation and of the domestic trade. The iron trade is ready to shoulder its portion of the burden. Official Washington must get down to serious business immediately if the war is to be brought to an early end.

## Mr. Daniels Changes Front

THE mental process of Secretary of the Navy Josephus Daniels is both a wonderful and painful thing to observe. Not long ago armor plate manufacturers asked him to have the federal trade commission make an investigation as to the cost of manufacturing this product and then to name a reasonable profit for the material. That would have ended the squabble between Mr. Daniels and the manufacturers, who stood ready to agree to the price terms named by the commission. Mr. Daniels scoffed at the idea. No such investigation was permitted. He insisted upon his hobby, the government-owned armor plate plant, a folly born of politics. If it ever comes into being no doubt it will be bred in politics, but Mr. Daniels now announces as expected the construction has been postponed indefinitely.

Did Mr. Daniels at that time have no confidence in the federal trade commission? Or was he afraid that, with such an able business man as Edward N. Hurley on the commission, its findings would justify the prices charged by the government for armor? Now Mr. Hurley is no longer with the commission. As constituted at present that organization is a rather colorless affair, and judging from the lack of real information that can be secured from it, it either has none to give or is operating along star chamber lines. Yet Mr. Daniels seems to have suddenly acquired vast confidence in the ability of the commission. It was Mr. Daniels who first suggested that the commission begin a series of investigations of industries of all kinds, including the steel industry.

It would be interesting for Mr. Daniels to explain this turn-coat attitude of his. The public would appreciate the reasons prompting his change of views. It is probably too much to hope that they would show he has seen the light of wisdom and is rectifying his mistaken judgments of the past.

## Castings or Red Tape?

ONE of the largest government arsenals recently asked for bids on a lot of steel castings. The specifications and blueprints were sent to a number of prominent steel foundrymen throughout the country, but when the day for opening the bids arrived, it was found that only one proposal had been submitted. Does this indicate lack of patriotism on the part of steel foundrymen in a time of great national stress? On the surface, such might appear to be the case, but as so frequently happens, a little investigation into underlying causes shows that the trouble is due entirely to commercially impossible conditions which the government insists upon.

In the case under consideration the specifications for converter steel castings contained sulphur requirements which are impossible of attainment at present, due to irregularities in the coke supply. Commercial buyers, realizing that foundrymen recently have had to use coke containing as much as 23 per cent ash and 2.25 per cent sulphur, have waived the extremely low sulphur limits demanded by some of their specifications. In the army organization in charge of our arsenals, however, no one could be found who would assume the responsibility for any rearrangement to meet existing conditions, even though one foundryman interested in the matter took the question up with highest authorities in Washington.

In brief, at a time when the government needs castings as it never needed them before, nothing is being accomplished and no one can be found who has the nerve to cut the maze of red tape surrounding every order. This problem never will be solved satisfactorily until the business of supplying the army is placed in the hands of business men with technical and commercial training. In the very nature of things, the training of a regular army officer does not fit him to deal with commercial problems in an ordinary businesslike manner. At times like the present, would it not be more sensible to release the energies of army officers for service in the fighting contingents, leaving the task of supplying the army in the hands of men with business experience?

# Iron and Steel Prices

**Corrected to Wednesday Noon**

SCRAP, WAREHOUSE AND IRON ORE PRICES ON PAGE 108a

## PIG IRON

(Delivery this year.)

| | |
|---|---|
| Bessemer valley | $57.00 to 58.00 |
| Bessemer, Pittsburgh | 57.95 to 58.95 |
| Basic, Pittsburgh | 52.95 to 55.95 |
| Basic, eastern Pa. | 50.00 |
| Basic, Buffalo | 53.00 to 55.00 |
| Malleable, Pittsburgh | 55.95 to 58.95 |
| Malleable foundry, Chicago. | 55.00 |
| Malleable foundry, Phila. | 55.00 to 57.00 |
| Mallealble foundry, Buffalo. | 53.00 to 55.00 |
| No. 1X Phila. | 56.00 to 57.00 |
| No. 2 foundry, Pittsburgh. | 55.95 to 58.95 |
| No. 2 foundry, Cleveland. | 55.00 to 56.00 |
| No. 2 foundry, Ironton | 55.00 |
| No. 1 foundry, Chicago. | 56.00 |
| No. 2 foundry, Chicago. | 55.00 |
| No. 2X foundry, Phila. | 54.50 to 55.50 |
| No. 2X foundry, N. J. tide. | 54.75 to 55.75 |
| No. 2X foundry, Buffalo. | 52.00 to 54.00 |
| No. 2 plain, Philadelphia. | 54.00 to 55.00 |
| No. 2 plain, N. J. tide | 54.25 to 55.25 |
| No. 2 plain, Buffalo | 51.00 to 52.00 |
| No. 2 southern, Birmingham. | 45.00 to 46.00 |
| No. 2 southern, Cincinnati. | 48.90 to 50.90 |
| No. 2 southern, Chicago. | 50.00 to 54.00 |
| No. 2 southern, Phila. del. | 50.00 to 51.00 |
| No. 2 southern, Cleveland. | 49.00 to 52.00 |
| No. 2 southern, N. Y. | 49.75 to 50.75 |
| No. 2 southern, Boston | 50.50 to 51.50 |
| No. 2 south. interior, N. E. | 51.00 to 52.00 |
| No. 2 southern, St. Louis. | 51.40 to 53.40 |
| Virginia No. 2X, furnace. | 52.00 to 53.00 |
| Virginia, No. 2X, Phila. | 54.75 to 55.75 |
| Virginia, No. 2X, Jersey City | 55.00 to 56.00 |
| Virginia, No. 2X, Boston. | 55.25 to 56.25 |
| Gray forge, eastern Pa. | 50.00 |
| Gray forge, Pittsburgh | 52.95 to 53.95 |
| Gray forge, Birmingham | 38.00 |
| Silveries, 8 per cent, furnace | 80.00 to 85.00 |
| Silveries, 8 per cent, Chicago | 85.00 to 92.50 |
| Low phos. standard, Phila. | 92.00 to 93.00 |
| Low phos. Lebanon, furnace | 85.00 |
| Low phos., Pittsburgh | 82.00 to 85.00 |
| Charcoal, Superior, Chicago. | 59.50 to 62.00 |
| Charcoal, Superior, Buffalo. | 55.00 to 60.00 |
| Charcoal, Birmingham | 45.00 to 50.00 |

## COKE

(At the ovens.)

| | |
|---|---|
| Connellsville furnace | $13.00 to 13.75 |
| Connellsville furnace, contract | 10.00 |
| Connellsville foundry, contract | 12.50 |
| Connellsville foundry | 15.00 |
| Wise county furnace, contract | 7.00 to 9.00 |
| Wise county foundry, contract | 8.00 to 10.00 |
| Pocahontas furnace, contract. | 7.00 to 9.00 |
| New River foundry, contract. | 10.50 to 11.00 |
| New River furnace, contract. | 7.50 to 10.00 |

## FERRO ALLOYS

| | |
|---|---|
| Ferro manganese, prompt. | $450 |
| Ferro manganese, last half. | 400 to 425 |
| Spiegeleisen, 20 per cent furnace remainder of year. | 80.00 to 90.00 |
| Ferrosilicon, 50 per cent, Pitts. | 250 to 260 |
| Ferrosilicon, 50 per cent, Pitts., 1st quarter | 130.00 to 150.00 |
| Bessemer ferrosilicon, 9 per cent. | $89.00 |
| Bessemer ferrosilicon, 10 per cent. | 90.00 |
| Bessemer ferrosilicon, 11 per cent. | 92.50 |
| Bessemer ferrosilicon, 12 per cent. | 95.00 |
| Bessemer ferrosilicon, 13 per cent. | 100.00 |

Ferrosilicon prices at Ashland, Ky., Jackson and New Straitsville, O., furnaces.

## SEMI-FINISHED MATERIAL

### BILLETS

| | |
|---|---|
| Open hearth, Pittsburgh. | $100.00 to 105.00 |
| Open hearth, Philadelphia. | 90.00 to 110.00 |
| Open hearth, Youngstown. | 100.00 to 105.00 |
| Bessemer, Pittsburgh | 100.00 to 105.00 |
| Bessemer, Youngstown | 100.00 to 105.00 |
| Forging, Pittsburgh | 115.00 to 125.00 |
| Forging, Philadelphia | 115.00 to 125.00 |
| Forging, Chicago | 100.00 |

### SHEET BARS

| | |
|---|---|
| Open hearth, Pittsburgh. | $105.00 to 110.00 |
| Open hearth, Youngstown. | 105.00 to 110.00 |
| Open hearth, Cleveland. | 110.00 |
| Bessemer, Pittsburgh | 105.00 to 110.00 |
| Bessemer, Youngstown | 105.00 to 110.00 |

### WIRE RODS, MUCK BAR, SKELP.

| | |
|---|---|
| Wire rods, Pittsburgh | $95.00 to 105.00 |
| Muck bar, Pittsburgh | 85.00 to 90.00 |
| Grooved skelp, Pitts., nom. | 4.00c to 4.50c |
| Sheared skelp, Pitts., nom. | 4.50c to 5.00c |

## SHAPES, PLATES AND BARS

| | |
|---|---|
| Structural shapes, Pitts. | 4.50c to 6.00c |
| Structural shapes, Phila. | 4.659c to 5.159c |
| Structural shapes, N. Y. | 4.669c to 5.169c |
| Structural shapes, Chicago | 6.19c |
| Tank plates, Chicago | 10.19c |
| Tank plates, Pittsburgh. | 9.00c to 10.00c |
| Bars, soft steel, Pittsburgh. | 4.00c to 5.00c |
| Tank plates, Philadelphia. | 8.159c to 10.159c |
| Tank plates, New York. | 8.169c to 10.169c |
| Bars, soft steel, Chicago. | 4.50c |
| Bars, soft steel, Pittsburgh | 3.75c to 4.25c |
| Bars, soft steel, New York | 4.419c to 4.919c |
| Bars, soft steel, Phila. | 4.409c to 4.909c |
| Cotton ties, Pitts., June | $2.10 |
| Bar iron, Chicago | 4.50c to 5.00c |
| Bar iron, Philadelphia | 4.659c to 4.909c |
| Bar iron, Cleveland | 3.50c |
| Bar iron, New York | 4.669c to 4.919c |
| Bar iron, Pittsburgh | 5.00c |
| Hard steel bars, Chicago. | 4.25c to 4.50c |

## RAILS, TRACK MATERIAL

| | |
|---|---|
| Angle bars, Pittsburgh, base | 3.25c to 3.75c |
| Angle bars, Chicago, base | 3.25c |
| Standard bessemer rails, mill. | $38.00 |
| Stand. open hearth rails, mill | 40.00 |
| Light rails, 25 to 45 lbs., Chic. | 75.00 |
| Light rails, 25 to 45 lbs., Pitts. | 75.00 to 80.00 |
| Relayers, standard, mill | 38.00 to 40.00 |
| Relayers, light, Chicago | 60.00 |
| Relaying rails, light, St. L. | 58.00 to 62.00 |
| Spikes, railroad, Pittsburgh. | 4.75c to 5.00c |
| Spikes, railroad, Chicago | 4.25c to 4.50c |
| Track bolts, Pittsburgh | 5.50c to 8.00c |
| Track bolts, Chicago | 5.25c to 5.50c |
| Tie plates, Chicago | $70.00 to 75.00 |

## WIRE PRODUCTS

(To jobbers; retailers 5 cents more.)

| | |
|---|---|
| Wire nails, Pittsburgh | $4.00 |
| Coated nails, Pittsburgh | 4.00 |
| Plain wire, Pittsburgh | 3.95 |
| Galvanized wire, Pittsburgh | 4.65 |
| Polished staples, Pittsburgh | 4.15 |
| Galvanized staples, Pittsburgh. | 4.85 |
| Barb wire, painted, Pittsburgh. | 4.15 |
| Barb wire, galvanized, Pitts. | 4.85 |
| Cut nails, Pittsburgh | 4.50 |

## CHAIN, PILING, STRIP STEEL

| | |
|---|---|
| Chain, ⅜ in. proof coil, Pitts. | 7.50c |
| Sheet piling, base, Pittsburgh | 4.00c to 5.00c |

Cold rolled strip steel, hard coils, 1½ inches and wider by 0.100 inch and heavier, base per 100 pounds, 9.00c to 9.50c.

## Market Report Index


| | Page |
|---|---|
| *Weekly Market Report* | 59 |
| *Pig Iron* | 63 |
| *Ferro-Alloys* | 65 |
| *Coke* | 66 |
| *Rails, Cars, Track Materials.* | 67 |
| *Sheets* | 67 |
| *Bars* | 68 |
| *Plates* | 68 |
| *Scrap* | 69 |
| *Structural Shapes* | 70 |
| *Semifinished Steel* | 70 |
| *Steel Ingot Production* | 71 |
| *Iron Ore* | 71 |
| *Merchant Pipe* | 74 |
| *Cast Iron Pipe* | 74 |
| *Nonferrous Markets* | 74 |
| *Coke By-Products* | 101 |
| *Machine Tools* | 102 |


## SHEETS

(In cents per pound.)

### SHEET MILL BLACK.

| | |
|---|---|
| No. 28, open hearth, Pitts. | 9.00c to 9.50c |
| No. 28, bessemer, Pitts. | 9.00c to 9.50c |
| No. 28, open hearth, Chgo. | 9.69c |

### TIN MILL, BLACK

| | |
|---|---|
| No. 28, open hearth, Pitts. | 9.00c to 9.50c |
| No. 28, bessemer, Pitts. | 9.00c to 9.50c |

### GALVANIZED

| | |
|---|---|
| No. 28, open hearth, Pitts. | 10.25c to 11.50c |
| No. 28, bessemer, Pitts. | 10.25c to 11.50c |
| No. 28, open hearth, Chgo. | 11.19c |

### BLUE ANNEALED

| | |
|---|---|
| No. 10, open hearth, Pitts. | 8.50c to 9.00c |
| No. 10, bessemer, Pitts. | 8.50c to 9.00c |
| No. 10, open hearth, Chgo. | 9.69c |
| No. 10, open hearth, Phila. | 8.659c to 8.909c |

## TIN PLATE

(Per 100 lb. box.)

Tin plate, coke base, nom. 10.00c to 15.00c

## IRON AND STEEL PIPE

(Prices adopted June 18, 1917.)

Steel

| Diameter in inches. | Black. Per cent off. | Galv. Per cent off. |
|---|---|---|
| ⅛ to 3, butt | 42 | 28½ |

Iron.

(Prices adopted June 30, 1917.)

| Diameter in inches. | Black. Per cent off. | Galv. Per cent off. |
|---|---|---|
| ⅛ to 1½, butt | 33 | 17 |

## BOILER TUBES

(Price adopted April 2, 1917.)

| | |
|---|---|
| Steel, 3½ to 4½ inches, l. c. l. | 34 |
| Iron, 3½ to 4½ inches, l. c. l. | 28 |

## CAST IRON WATER PIPE

(Class B Pipe.)

| | |
|---|---|
| Four-inch, Chicago | 68.50 |
| Six-inch and over, Chicago. | 65.50 |
| Four-inch, New York. | 68.50 |
| Six-inch and over, New York | 65.50 |
| Four-inch, Birmingham | 58.00 |
| Six-in. and over, Birmingham | 55.00 |

Class A pipe is $1 higher than Class B.

## HOOPS, BANDS, SHAFTING

| | |
|---|---|
| Hoops, Pittsburgh | 6.00c to 6.50c |
| Bands, Pittsburgh | 6.00c to 6.50c |
| Shafting, Pittsburgh, carloads | 5 off to list |

## RIVETS

| | |
|---|---|
| Structural rivets, Pittsburgh. | 5.25c |
| Boiler rivets, Pittsburgh. | 5.35c |
| Tinner's rivets, Pittsburgh. | 40 off |

## NUTS AND BOLTS

(Delivered within 20-cent freight radius.)

### CARRIAGE BOLTS

(⅜ x 6 inches, smaller and shorter.)

| | |
|---|---|
| Rolled thread | 35 |
| Cut thread | 30 and 5 |
| Larger or longer | 20 |

### MACHINE BOLTS

(⅜ x 4 inches, hot pressed nuts.)

| | |
|---|---|
| Rolled thread | 40 |
| Cut thread | 35 |
| Larger and longer | 25 |
| Cold pressed, semi-finished, hexagon nuts | 50 and 5 |
| Gimlet and cone point lag bolts. | 40 |

### NUTS

| | |
|---|---|
| Hot pressed, square, blank. | $1.90 off |
| Hot pressed, square, tapped. | 1.70 off |
| Cold pressed, square, blank. | 1.25 off |
| Cold pressed, square, tapped. | 1.00 off |
| Hot pressed, hexagon, blank. | 1.70 off |
| Hot pressed, hexagon, tapped. | 1.50 off |
| Cold pressed, hexagon, blank. | 1.25 off |
| Cold pressed, hexagon, tapped. | 1.00 off |

## Prices Present and Past

**(Yesterday, a month ago, three months ago and a year ago.)**

**Quotations on leading products July 11, average for June, 1917, average for April, 1917, and average for July, 1916. Prices are those ruling in the largest percentage of sales at the dates named.**

| | Prices July 11, 1917. | Average prices June, 1917. | April, 1917. | July, 1916. |
|---|---|---|---|---|
| Bessemer pig iron, Pittsburgh.. | $57.95 | 55.20 | 42.20 | 21.95 |
| Basic pig iron, Pittsburgh..... | 52.95 | 50.20 | 39.70 | 18.95 |
| No. 2 Foundry pig iron, Pitts.. | 55.95 | 51.02 | 39.95 | 19.45 |
| No. 2 Foundry pig iron, Chgo.. | 55.00 | 51.00 | 39.25 | 19.00 |
| Lake Superior Charcoal, Chicago | 59.50 | 51.80 | 42.20 | 19.75 |
| Malleable, Chicago ..... | 55.00 | 50.50 | 39.00 | 19.50 |
| Southern No. 2, Birmingham... | 46.00 | 35.75 | 24.50 | 15.00 |
| Southern Ohio No. 2, Ironton.. | 54.00 | 38.60 | 33.00 | 18.50 |
| Basic, eastern Pa..... | 50.00 | 46.375 | 38.25 | 19.25 |
| No. 2X Virginia, furnace..... | 52.50 | 46.50 | 38.25 | 18.50 |
| No. 2X foundry, Philadelphia.. | 54.50 | 47.50 | 41.50 | 20.00 |
| Ferro mang., delivered..... | 450.00 | 431.25 | 360.00 | 175.00 |
| Bessemer billets, Pittsburgh.... | 100.00 | 93.75 | 72.50 | 40.00 |
| Bessemer sheet bars, Pittsburgh | 100.00 | 101.25 | 72.50 | 40.00 |
| Open hearth sheet bars, Pitts.. | 105.00 | 101.25 | 72.50 | 40.00 |
| Open hearth billets, Pittsburgh. | 105.00 | 93.75 | 72.50 | 40.00 |
| Steel bars, Pittsburgh..... | 4.00 | 3.62 | 3.38 | 2.50 |
| Steel bars, Chicago..... | 4.75 | 4.55 | 3.54 | 2.35 |
| Iron bars, Philadelphia..... | 4.659 | 4.259 | 3.659 | 2.559 |
| Iron bars, Cleveland, local del'y | 4.25 | 3.50 | 3.00 | 2.40 |

| | Prices July 11, 1917. | Average prices June, 1917. | April, 1917. | July, 1916. |
|---|---|---|---|---|
| Iron bars, Chicago mill..... | 4.75 | 4.00 | 3.19 | 2.35 |
| Beams, Chicago ..... | 6.19 | 4.65 | 3.80 | 2.69 |
| Beams, Pittsburgh contract..... | 4.50 | 4.00 | 3.46 | 2.50 |
| Beams, Philadelphia ..... | 4.909 | 4.659 | 4.659 | 2.659 |
| Tank plates, Pittsburgh..... | 9.00 | 4.50 | 4.50 | 2.86 |
| Tank plates, Chicago..... | 10.19 | 7.90 | 4.70 | 3.09 |
| Tank plates, Philadelphia..... | 10.159 | 9.659 | 7.159 | 3.909 |
| Sheets, blk., No. 28, Pittsburgh | 9.00 | 8.13 | 5.75 | 2.90 |
| Sheets, blue anld., No. 10, Pitts. | 8.50 | 5.57 | 5.37 | 3.00 |
| Sheets, galv., No. 28, Pittsburgh | 10.25 | 9.95 | 7.56 | 4.37 |
| Wire nails, Pittsburgh..... | 4.00 | 3.62 | 3.20 | 2.50 |
| Connellsville fur. coke, contr... | 10.00 | 8.50 | 7.25 | 2.42 |
| Connellsville fdy. coke, contr... | 12.50 | 10.10 | 7.90 | 3.15 |
| Heavy melting steel, Pittsburgh | 44.00 | 40.00 | 28.10 | 16.25 |
| Heavy melting steel, eastern Pa. | 38.00 | 36.625 | 26.00 | 15.00 |
| Heavy melting steel, Chicago... | 35.50 | 37.00 | 26.60 | 14.15 |
| No. 1 wrought eastern Pa..... | 57.50 | 47.875 | 40.00 | 19.75 |
| No. 1 wrought, Chicago..... | 40.50 | 41.75 | 29.80 | 13.90 |
| Rerolling rails, Chicago..... | 47.00 | 46.00 | 31.90 | 15.70 |
| Car wheels, Chicago..... | 37.50 | 37.00 | 23.25 | 12.25 |

*Seaboard.

(For Additional Prices See Page 108a)

# Uncertainty Halts Iron Trading

### Buyers and Consumers Wait Upon Washington Developments—Sales and Inquiries Drop—Some Reports of Easing Up in Bessemer Prices —Southern Quoted at $48 for Last Half of 1918

Pittsburgh, July 10.—Two factors of rather far-reaching influence are causing the market for pig iron to be extremely quiet. It is apparent that both buyers and sellers prefer to await developments at Washington, where definite steps regarding prices may soon be taken, before figuring further in the market for extended delivery. Aside from the detrimental influence caused by prospects of price regulation, the general market is going through the usual period of inactivity during the summer months. Sellers of steelmaking grades say they have not had a nibble for iron this month; this, however, has caused no surprise or apprehension, since melters some time ago covered their third quarter requirements. In addition, tremendous tonnages of iron have been sold for shipment in the fourth quarter of 1917 and the early part of 1918. The President's proclamation against the shipment of materials entering into the manufacture of steel to both neutral and belligerent countries, except under license, had been expected. The embargo against the exportation of iron will not affect the domestic situation, according to usually well posted authorities. The bulk of the metal shipped abroad by valley producers was purchased by the Italian government, which undoubtedly will experience no difficulty in obtaining all the metal this country can spare. The position of prices is unchanged. Bessemer is selling at $57, basic $52, foundry and malleable at $55, valley, and above.

#### Consumers Want Silvery Iron

Chicago, July 10. — Silvery iron has been inquired for by several consumers and is quoted at $82.50 to $90, Jackson County furnace, for the 8-per cent grade. Quotations have been offered between these margins, but no sales have been reported. One lot of 6 to 7-per cent Tennessee silveries was offered at $58.25, Chicago, last week. The tonnage was small and the amount was taken quickly. Little activity is reported on the various grades of northern iron. Lake Superior charcoal iron is still quoted at $59.50, Chicago, and although a few carload lots are available from time to time, no large quantities are being sold as the furnaces are booked to capacity for the remainder of this year and, in general, for the first half of next year. No further sales of No. 2 foundry iron for last half of 1918 have been recorded. The quotation on this grade for first half seems firmly fixed at $55. A sale of 2000 tons of No. 2 foundry iron to be delivered, half in 1917 and half during first part of 1918, was closed this week at $55, Chicago. Comparative quiet prevails in the Chicago market for southern iron. The Sloss-Sheffield Steel & Iron Co. books have been closed for the first half of 1918, and little tonnage of any grade is available. Prices are quoted at $50 to $54, Chicago, for delivery during this year on No. 2 southern foundry, and $50, Chicago, for first half of 1918.

#### Prices Advanced Despite Dullness

New York, July 10.—Despite the fact that demand for pig iron now is less active than at any time in months, a number of furnaces have effected further advances in prices. The Virginia Iron, Coal & Coke Co. now is asking $52.50 for No. 2X for first half; one Buffalo furnace has raised its minimum to $55 on No. 2X for first quarter and to $53 for second quarter; another Buffalo furnace now quotes $55 minimum for first half; an

eastern Pennsylvania furnace, which last week was quoting $53, furnace, for No. 2X for this year and $52 for first half, has advanced to $54 and $53, respectively; another eastern Pennsylvania maker has raised from $55 to $56, furnace, for any shipment. The market is dull, particularly as to foundry iron. Very few new inquiries for foundry have come out. The General Electric Co. has bought a few small tonnages for early shipment, but has not yet taken action on its inquiry for 10,000 to 15,000 tons of foundry for fourth quarter and first half. Considerable export inquiry is before the trade, but it is unlikely that much of this business will be placed until the conditions surrounding the export embargo are ascertained. Included in export sales was a block of nearly 1000 tons of Alabama foundry at $46 for shipment by way of the Pacific coast to Japan. No basic or bessemer have been sold in this district during the week. The only domestic inquiry for steelmaking iron has come from three eastern Pennsylvania consumers who want a total of about 6000 to 8000 tons of low phosphorus. Lebanon low phosphorus, which was quoted at $90 a week ago, has been offered today for shipment over the remainder of this year at $82.50 to $85, eastern Pennsylvania.

### Virginia Seller Reappears

Philadelphia, July 10.—The Virginia Iron, Coal & Coke Co. today telegraphed the trade that it again is in the market for first half at $50, furnace, the same figure quoted when it previously was in the market late in June. It is offering only No. 2X and will accept only small tonnages. Later the $50 price was withdrawn and $52.50 now is asked. The iron market in this district is the least active in many months; in fact, the situation is almost dull. This is due to some extent to the fact that consumers are pretty well covered, but mainly to uncertainty as to how proposed government regulation of prices and other possible federal action will affect the general market. The market is every whit as strong as at any time in recent months; most makers are disinclined to sell, while only a few show actual willingness to take orders for any shipment. The minimum for eastern Pennsylvania foundry now is $54, furnace, for No. 2X for this year and $53 for first half. In most cases, however, quotations are $55 and even $56 for any position. Minimum on central Pennsylvania No. 2X is $54, furnace, for this year and $53 for first half. Virginia foundry for this year has not figured importantly during the week; the price is around $52 to $52.50, furnace, for No. 2X. The largest new inquiry is for 6400 tons for the Lenoir Car Works, Lenoir City, Tenn., 6000 for first half and 400 for this year. This inquiry includes 2000 tons of special analysis bessemer, while the rest is foundry. A Philadelphia district consumer wants 1000 tons of low silicon foundry. The only inquiries for steelmaking iron before the trade involve 2500 tons of standard low phosphorus for last half shipment to the American Locomotive Co.'s plant at Chester, Pa., and approximately 1500 tons of low phosphorus for this year and next to a consumer outside this district.

### Furnaces Decline to Quote

Buffalo, July 10.—The market appears to be very strong with very little iron available for 1917 delivery. Some of the interests are declining to make quotations for 1918 delivery, preferring to get the 1917 orders cleaned up before quoting, particularly as the quotations will be for a time considerably after important federal developments are to be looked for. Almost all the furnaces are out of the market for 1917 delivery, declining even carload lots. The 1918 inquiry is not particularly active, buyers apparently awaiting for developments during the next two or three months. Prices are very firm and there is a tendency to advance. Quotations on 1918 tonnage are at $53 to $55, where they are made at all, and for this year where any quotations can be had, the price is from $55 to $58. There is very little tonnage procurable for the first quarter and first half of 1918.

### Consumers' Interest Declines

Cleveland, July 10.—Consumers of iron show a greater disposition to hold off on new inquiries and buying, waiting for Washington developments. The market accordingly is much quieter. Producers and sellers are welcoming the breathing spell after the rapid action in recent weeks and are making little effort to dispose of metal. Demand remains such, however, that wherever any iron is offered around prevailing market prices, it is absorbed quickly. A Virginia interest offered iron for the first half of 1918 at $50, furnace, for No. 2X, or $53.20, Cleveland, and amassed such sales that it advanced later in the same day to $52.50, furnace, which it continues to quote. Small lots of late foundry and malleable for first half of next year were sold at $57 to $58, furnace, and certain producers quote $57, minimum. On a small lot of foundry for first half for next year $60, furnace, was named. Malleable is very scarce and a small prompt order for charcoal commanded $64.50, delivered this territory. Beyond the additional buying of a northwestern Pennsylvania consumer, basic has been less active. This buyer closed for 7000 to 8000 tons additional for last half and first half and for 2000 tons of low phosphorus. For this year $55, valley, was paid for basic. Two eastern inquiries for 5000 tons each have been current recently. A carload of 8 per cent silvery for early shipment was sold in this district at $85, Jackson furnace. Producers of iron in northern Ohio and western Pennsylvania are finding it almost impossible to ship very far to the east without special government permit, by reason of the embargo.

### Offer Southern at $45

Cincinnati, July 10. — After several weeks of feverish activity, that was really encouraged, rather than otherwise, by the rapidly advancing prices, the market now seems to be slowing down some. The general inquiry is lighter and the scarcity of iron for prompt shipment curtails the purchase of many small lots that will be needed for nearby delivery. In the south a little resale iron for this year's shipment has appeared, but where shipments can be made as wanted, this iron generally brings a premium over minimum market figures quoted. No changes have been made in quotations, with the exception of an advance to $56 Ironton on northern No. 2 foundry for the first half, although for that delivery it is understood that a firm offer from an old customer would be accepted at the former quotation of $55. A large southern producer has been quietly offering some iron in this territory at $45, Birmingham for first half, and has placed a few contracts at this price. As an evidence of the caution observed by this

## Again Breaks Record in Furnace Building

Another record of rapid blast furnace building was broken July 3, when the Cambria Steel Co. applied the torch to the No. 11 stack at the Franklin works, at Johnstown, the construction of which first was undertaken May 7. Only 57 days were spent in erecting the stack. The previous record for blast furnace construction, 85 days, also was made by the Cambria Steel Co. The new furnace has a rated capacity of 500 tons per day and was designed and erected by the engineering department of the Cambria company, working under the direction of J. C. Ogden, general superintendent.

producer all orders were accepted subject to confirmation by the head office in the south. Rumors that another block of southern basic had been sold for first half shipment in this territory are without foundation. The Virginia furnaces now are not offering any iron here, with the exception of a few odd lots that are generally taken by the first melter approached. No late sales of Ohio silvery irons have been reported, but the minimum price on the last lots of 8 per cent iron sold was $85, furnace.

### Both Sides Are Waiting

St. Louis, July 10.—Quietness was the outstanding feature of the pig iron market here throughout the past week. There was no change in general conditions of supply and demand, but both buyers and sellers were disposed to await definite news relative to the government program. Inquiries aggregating a considerable volume were reported, but most of them were of a routine sort, and few actual transactions either for immediate or future delivery were consummated. Consumers take the view that owing to the ultra high prices existing they can lose little by waiting. Producers argue that the commercial demand is great enough to absorb all outputs, and they can lose nothing by waiting on announcements from Washington. The car situation has not improved to any noticeable extent, and there is still much complaint of backwardness on deliveries, especially from Alabama. Prices remain stationary. Producers at Birmingham are firm in their views, and are asking $50 for No. 2 foundry clear through the first half of 1918. Foundries in this district are sold up weeks ahead, and are playing a passive part in the market at the moment. Charcoal iron is in demand, and a small lot sold this week at $58.40, which is the highest heard of thus far.

### $48 for Last Half of 1918

Birmingham, Ala., July 10.—Schedules have been sent out by southern manufacturers of pig iron for the last half of 1918 and $48 for No. 2 is being quoted. Spot No. 2 foundry and basic command $50 per ton, while reports have it that special brand and analysis irons have sold in this district above $50 for delivery during the last half of this year. Several of the companies still are reported out of the market, apparently waiting to catch up on orders. Deliveries are good in comparison to what they were several months ago, and further reduction of accumulated stocks is noted. The average price of the iron leaving the south yet is under $30, it is estimated. This takes into account the delivery by the Sloss-Sheffield Steel & Iron Co. of its large English basic order taken last year at $14. However, there are many cars of iron leaving the Birmingham district at prices above $35 and $40 for No. 2.

Inquiries are in hand for a large quantity and some of the larger consumers are seeking concessions for last half delivery. The instructions to agencies as to that period would indicate that no effort is to be made to get business and that the high price will be maintained, anyway for the time being at least and possibly for some time to come.

The production of iron in Alabama in July will show an increase over that of June. One additional furnace will have two weeks' make to report and a second furnace may add at least one week to ten days' make. Intra-district transportation facilities have been improved and there is no interruption in the operations at blast furnaces by reason of any shortage of ore or coke.

# Ferro Market Eases Up

### Metal For Both This Year and Next Sells at Lower Prices —Ferrosilicon Also Less Firm

New York, July 10.—The ferromanganese market reflects an easier tone and sales involving a considerable tonnage in the aggregate have been made during the past week at lower prices. Prompt carloads have been sold at less than $425, delivered, and a business of rather large proportions was done at $350, delivered, for first half although some first half business went at $350, furnace, and some at as high as $375, delivered. The market may be quoted at $400 to $425, delivered, for prompt shipment, $375 to $400 for fourth quarter and at $350 for first half. These prices apply to domestic ferromanganese as no English now is being offered. It develops that at least 2125 tons of English ferromanganese enroute to this country have been sunk by submarines during the past three weeks.

The market in spiegeleisen is characterized by a fair amount of business, but this is not being done at the advances which recently were announced by some of the makers. Lots ranging from a carload up to 100 or 200 tons each have been sold during the week around $85 for prompt and third quarter shipment and $80 for last quarter. First half of next year has been sold around $74 and $75, furnace. A fair amount of inquiry now is pending.

Fifty per cent ferrosilicon is less firm and the market on carloads for shipment this year now may be quoted at $225, and it is considered likely that this figure now can be shaded. Contracts for ferrosilicon for delivery over the first half of next year continue obtainable at $130, delivered.

### Alloys Advancing Steadily

Pittsburgh, July 10.—Several makers are quoting lower grades of ferrosilicon at as high as $105, furnace, for No. 10 per cent; that figure is $15 a ton above the price at which the last tonnage of importance was sold. Not much metal is available for delivery before Jan. 1. Ferromanganese continues to be listed at a rather wide range, dealers asking $400 to $450, depending upon the delivery. A heavy demand exists for 50 per cent ferrosilicon and spiegeleisen, but prices are not well defined.

### Little Activity at Chicago

Chicago, July 10.—Few inquiries have been received for ferromanganese and spiegeleisen and little activity is reported in this market. Ferromanganese is quoted at $450 for delivery this year and $400 for 1918 delivery. Spiegeleisen remains at the same level with prices firm at from $87 to $87.50, eastern furnace, for last half. Quotations for first half of 1918 average around $5 lower.

## Now Making Ferro

The Donner Steel Co. is operating its "A" furnace at Tonawanda, N. Y., on ferromanganese, the output being around 60 tons per day. Its second furnace continues to operate on foundry.

## Rebuilding Burned Plant

The Standard Spiral Pipe Works, Chicago, is rebuilding the plant damaged by fire about a month ago. Work also has been started on a building to house an additional pipe shop and a forge department, 75 x 150 feet. Equipment of the new building is to consist of 20 hammers and a battery of bulldozers. The additional equipment will enable the company to engage in the manufacture of drop forgings, dies and other products.

# Spot Coke on Toboggan

## Quickly Drops $4 Below Top Price—First Half Contract Market Opens at $10—Car Supply Improves

Pittsburgh, July 10.—Quotations on spot blast furnace coke dropped like a spent rocket the latter part of last week, when the market first began to pursue a more nearly normal course. Furnace coke has been sold at $13 a ton at the ovens, or $4 below the price prevailing a week ago. Talk of $12 coke is heard. The closing of saloons in Fayette county on July 4 and a better car supply last week are responsible for lower prices on coke. The car supply last week was 75 per cent of normal, compared with 72 per cent for the week before and 65 per cent for the month of June. During the first five months of this year the car supply was 57 per cent. On Monday and Tuesday of this week the car supply averaged about 90 per cent. The market for contract coke was opened a few days ago when a valley blast furnace interest bought a rather large block for shipment in the first half of 1918 at $10, ovens. A 2000-ton monthly transaction for the last half at $12 is reported. Now that the ice has been broken, it is believed that additional contracts will be placed at an early date. Foundry coke for extended delivery is selling at $12.50 and at $15, ovens, for spot shipment. Production of coke the week ending June 30 was 371,168 tons, compared with 361,661 tons the week before, according to *The Connellsville Courier*.

### Offer Spot Much Lower

New York, July 10.—Prices on furnace coke during the past few days have been receding rapidly. Yesterday approximately 100 cars of spot furnace coke were sold at $13, Connellsville. Today spot furnace coke is offered in the east at $12.50, Connellsville. These prices compare with $16, Connellsville, which was realized in the east a week or 10 days ago.

### Offer Spot $2.00 Lower

Philadelphia, July 10.—With the Fourth of July holiday past, and a less pronounced scarcity of cars, the coke market is softening from its recent high price levels. Spot furnace coke today was offered at $14 and $14.50, Connellsville. These figures compare with $16, which was done on a large tonnage in this district about a week ago.

### By-Product Sells High

Chicago, July 10. — Prices of by-product coke in the Chicago district have reached phenomenal levels. During the past week several sales of small tonnages have been made at from $18 to $20 a ton. An indication of the situation is given by the fact that southern furnaces have inquired for coke in this territory. By-product cokemakers have closed their books and refuse to accept any further business. Regular customers are receiving all available coke. Interrupted shipments of coal from the regular fields have forced cokemakers to secure such coal as is available. This factor has a tendency to not only curtail the production but to decrease the quality of the coke.

### Outsiders in St. Louis Market

St. Louis, July 11.—The feature of the coke situation here is a great demand from territory which never before appeared as a purchaser in the St. Louis market. Inquiries of this sort received during the past 10 days will aggregate in excess of 50,000 tons. Chicago has tried to buy here, and an inquiry for 10,000 tons of furnace coke from Milwaukee is reported. There have been orders of a more or less urgent character, also, from western points clear to the Pacific coast, and to the Rio Grande. For many weeks Mexico has been inquiring here, and it would be possible to close liberal tonnages with smelters in Northern Chihuahua and Sonora were it possible to secure the coke. According to dealers, virtually all of this business is being turned down because they have nothing to sell. There is a strain to supply the regular trade. By dint of incessant fighting for cars, dealers have been able to keep up contract deliveries well. Prices are difficult to gage. By-product was sold in the week at $16, St. Louis, but that figure is low, and none is offering under $16.50 to $17 now. Connellsville and Virginia foundry coke is quoted from $17.95 to $19.95, St. Louis. The slowing down in the demand and easing off in lead and spelter prices has affected the demand for coke from the smelter interests.

### Sales at Any Price

Cincinnati, July 10.—Reports received from all producing districts show that spot foundry coke is being sold at almost any price the oven operators care to ask. In the Connellsville field spot foundry coke has been bringing $15 to $16, ovens, with complaints as to shipments being delayed enroute. No furnace coke has lately been sold, with exception of some for domestic use. Contract figures are unchanged but firm. New River foundry coke for this year is around $12 to $14. Wise County and Pocahontas foundry brands bring all the way from $11.50 to $14, depending on the shipment wanted. No yearly contracts have been made lately, but these figures could doubtless be shaded on business of that character.

### Little Southern Coke Offered

Birmingham, Ala., July 10.—A few cars of coke again have been sold in the Birmingham district around $15.50 and $16. While manufacturers say there is none to be offered in the open market, sales of a little foundry coke at $12.50 to $15 are noted from time to time. One of the prominent coke producers of the district announced during the past week that it would be two months and longer before any business could be considered. Some contracts have been renewed for 12 months and even longer. Some furnace coke is said to have been sold as high as $8 and $10 in this district, though many contracts are in existence now at $6 and under.

## High Coke Price Forces Mill Cinder Drop

Philadelphia, July 10.—Mill cinder for delivery to Jan. 1 not only is not bringing the advances which the mills were inclined to ask but actually is selling at 50 cents to $1.00 per ton less than last January. The high prices of coke are responsible for this decline since it requires more coke to melt mill cinder in blast furnaces than ore. Hence cinder is less desirable than usual. The amount of cinder offering is much less than last January since many of the mills then disposed of their full year output.

Rolling mill scale, which requires no more coke than ore, is bringing about the same prices as six months ago. Numerous mills are selling for the next six months while others continue to sell monthly.

## Enlarging Steel Output

A 75-ton open-hearth steel furnace is being added to the works of the Edgewater Steel Co., Oakmont, Pa., which now has one 25-ton and one 75-ton furnace in operation. The company is making ingot molds and open-hearth steel ingots. Equipment is being installed for the manufacture of locomotive and car wheel tires, rolled steel car wheels, roll shells, ring dies, turbine rings and gear rims.

# Sheet War Needs Huge

### Estimated 150,000 Tons Still to be Distributed and 40 Per Cent of Output Eventually Absorbed

Pittsburgh, July 10.—Additional orders, involving heavy tonnages, have been distributed under the direction of the subcommittee of the American Iron and Steel institute, working in conjunction with the national defense council. It conservatively is estimated that at least 40 per cent of the sheet mill capacity of the country will be engaged in the manufacture of munitions in one form or another before the end of the year; at present, about 10 per cent of the output of sheet mills is entering into the manufacture of military necessities. Members of the sheet committee have made a creditable record in their efforts to serve the nation as efficaciously as possible. War orders have been distributed so equitably that interests of domestic consumers have not been jeopardized. Several mills are in a position to accept additional orders for shipment before autumn. They are selling material at decidedly high prices, although no change is noted in published quotations.

#### Expect Heavy Tonnage to be Placed

Chicago, July 9.—Although there is a heavy demand for sheets in the Chicago district, makers have accepted practically no business. Government orders for sheets are taking a large share of the mills' capacities and manufacturing interests in general are unable to obtain sheets at any price for any delivery. It was reported here today that in spite of the heavy sheet contracts already placed by the government, further contracts amounting to 150,000 tons still remain to be distributed among the various sheetmakers. It is the expectancy on the part of mills of receiving further government orders that make some reluctant to accept any other business at present. No. 28 open-hearth black sheets are quoted at 9.69c, Chicago; No. 28 open-hearth galvanized at 11.19c, Chicago; and No. 10 blue annealed at 9.69c, Chicago.

#### War Needs Below Expectations

Youngstown, O., July 10.—Government requirements of steel sheets from valley mills are increasing, but not rapidly. In the case of one important maker inquiries from government sources during the past week have been a little less than the week before, but one of the smaller makers reports a greater number. Quartermasters apparently are not circularizing all the mills in the valley when they want a certain tonnage, or collection of tonnages, and the belief is current here that the government could get better and quicker results if they were directed to do so. On the whole, the mills in the Mahoning valley are not getting as large a share of government orders as some had been led to believe they would get. Some of the makers had tentatively arranged their rolling schedules so as to take care of a greater share of army and navy requirements than have been given them so far, and did this at a sacrifice of commercial business 10 to 25 per cent more profitable. A few of these makers still have their decks cleared to accommodate their maximum estimate of what the government may call upon them; others are giving the commercial consumer a little more encouragement, but with the understanding that he may be disappointed in his deliveries. Less than 15 per cent of the sheet-making capacity of the valley mills is engaged in government work, direct or indirect, and it is estimated by some that the figure is closer to 10 per cent. The uncertainty as to price action by the government has had a restraining effect on quotations in this territory. For bessemer No. 28 black, 8.75c to 9c represents the commercial market, with one maker asking as high as 9.25c. The leading producer of black sheets continues out of the market. No. 10 blue annealed brings from 8.50c to 9c, and No. 28 galvanized from 10.75c to 11. Open-hearth sheets are from $5 to $10 a ton higher. All grades are scarce. Most of the mills report better traffic conditions this week than has been noticeable for some time past.

# Car Orders Are Heavier

### Roads Place More Equipment as Prospects For Government Program Droop—Light Rails in Active Demand

New York, July 10.—Orders for cars are more liberal as the prospects for the government buying 100,000 cars have faded. The Grand Trunk railroad which recently inquired for 2000 box cars, has placed 1000 of these with the American Car & Foundry Co.; the remaining 1000 cars were withdrawn. The Northern Pacific has placed 1000 box cars with its own shops and will obtain the center constructions for these cars from the Bettendorf Co. The Chicago & Northwestern railroad has let 375 center constructions to the American Car & Foundry Co. The Standard Steel Car Co. has taken an order for 250 gondolas for the Phelps Dodge Corp. Other recent awards are as follows: United States navy, 11 flat and seven box to the American Car & Foundry Co.; Philippine Vegetable Oil Co., 100 tank to American Car & Foundry Co.; Swift & Co., 25 tanks to Standard Steel Car Co.; Missouri Pacific, 500 box to its own shops; United States army, one gun car.

New inquiries involve 100 hoppers for the Semet-Solvay Co.; 100 tank for the Shell Co.; 50 hoppers, 250 gondolas and 100 miscellaneous cars for the Lake Terminal railroad; 30 hoppers, 15 flat and five gondolas for the McKeesport Connecting railroad; 100 flat for the Florida East Coast Line and 40 hoppers and 15 gondolas for the Benwood & Wheeling connecting railroad.

A number of builders as a result of the preliminary negotiations have submitted designs of standard construction cars to the government. It now is believed, however, nothing further will develop in this project. Several small lots of standard open-hearth rails averaging 100, 200 and 300 tons each, have been sold both to railroads and manufacturing plants at $75, mill, for use in terminal and switch work. Numerous small orders for tie plates and angle bars have been placed during the week. Tie plates now are quoted at 4.50c to 5c and angle bars at 4c to 4.50c.

The American Locomotive Co. has taken an order for three locomotives for the Kure yard of the Imperial Japanese navy.

#### Track Bolts Higher

Philadelphia, July 9.—Track bolts now are quoted at 8c base, mill, an advance of 1.50c during the week. Boot spikes also are quoted at 8c, a similar advance.

#### Mines Take Track Equipment

Pittsburgh, July 10.—Heavy tonnages of light rails and track equipment are being purchased by industrial and mining interests at comparatively high prices. There are also inquiries pending for light rails for portable tracks for military use. Light rails recently have been quoted at $90 a ton for sections weighing 25 to 45 pounds. Railroad spikes are being sold at as high as 5c for standard sizes. One of the more important spikemakers in western Pennsylvania has withdrawn from the market.

# Auto Builders Cut Down

### Various Plants Turn to Trucks and Aircraft—More Shell Bar Steel Placed—Shafting is Active

Cleveland, July 10.—Inquiries for bars and other steel materials for aeroplane construction are coming out more freely, as plans are being formulated for production of aircraft on a large scale. Some of the automobile builders have interested themselves extensively in this class of production and as the demand for pleasure cars, especially the higher-priced types, continues to decline, this interest is expected to grow. The automobile situation is such that only the builders of the moderate-priced cars, numbering less than 10, are running full, while operations with other plants have been curtailed considerably. Some of the latter are meeting the situation by preparing to go into army truck manufacture. More hesitation in buying or inquiring for steel is shown by consumers except those who are concerned with government orders. Reinforcing bars are quoted around 4c, mill.

#### Mills Refuse Orders

Chicago, July 10.—Only very small tonnages of steel bars are being accepted by makers for delivery in 1917. No orders have been accepted for 1918 delivery. Although mills are not working to capacity on government orders, makers are reluctant to accept further business until a definite policy of purchase has been decided by the government. Soft steel bars are quoted at 4.50c, Chicago. Hard steel bars are quoted at from 4.25c to 4.50c, Chicago. Practically no tonnages have been accepted by makers and inquiries for 1918 receive but little attention. No business for this period has been accepted yet.

#### Government Takes Rounds

Pittsburgh, July 10.—Additional orders for 1-pound shells have been placed by the government, although nothing has been given out for publication as to the distribution of these contracts. Mill managers apparently have been directed to refrain from talking specifically about the manufacture of material for military necessities. Steel bars are quoted at 4.50c and above. Iron bars are commanding 5c for delivery at the makers' convenience.

#### Discard Bars Sell High

Philadelphia, July 10.—Business in the steel bar market in this district this week has comprised mainly small tonnages for nearby shipment. A considerable portion of this business went at 4.50c, Pittsburgh, which is minimum, and some of it went as high as 5c. More activity than usual was reflected in bars rolled from shell discards; sales of such bars involved from 1500 to 2000 tons, at 4.50c and 4.75c, mill. The iron bar market is less active than has been usual of late. A few quotations of 4.50c, Pittsburgh, have been made during the week but the market generally is 4.75c, and one maker has quoted 5c on some inquiries.

#### Few Small Tonnages Accepted

Chicago, July 10.—Makers of iron bars are accepting no orders which interfere with the demands of the government and but few tonnages have been placed recently. Occasional contracts for small tonnages of from 50 to 300 tons have been accepted by one or two mills. The quotation on bars of 4.50c to 5c, Chicago, remains firm.

#### Hoops and Bands High

Pittsburgh, July 10.—Distilling interests are dropping out of the market for steel hoops, but this in no way has affected the general situation. Mills in a position to meet specifications for shipment by October 1 are selling both hoops and bands at 6.50c. Several manufacturers are out of the market until the early part of 1918.

#### Shafting Makers Fill War Orders

Pittsburgh, July 10.—Shafting manufacturers continue to be called upon for large quantities of material for fuses and shell parts. It is estimated conservatively that approximately 10 per cent of the output of the mills is entering into the manufacture of munitions in one form or another. Domestic consumers are paying from 5 per cent off the list to list prices for delivery at the convenience of the maker.

# War Tonnage Restrains

### Plate Specifications for Government Begin to Retard Private Deliveries—Many New Orders Are Turned Down

Philadelphia, July 10. — Government specifications for plates are becoming more numerous and gradually are absorbing a large proportion of the output of the mills, so that they are beginning to interfere with deliveries to private customers. Demand for plates continue of large proportions; among current inquiries are one for 25,000 tons for export, another for 5000 tons and another for 3000 tons. At the same time, however, current inquiries are not as abundant as was the case a month or two ago. This is due to some extent to uncertainty as to how far the government will regulate prices and control distribution of output, and also to the fact that the government is furnishing steel for vessels and for other construction. Prices continue unchanged at 10c, Pittsburgh, for tank plates and 11c to 12.50c, for Lloyds ship steel, for delivery at mills' convenience, which in most cases is nine to 12 months from the time the order is placed. The mills are making every effort to produce a maximum output and are running close to 100 per cent.

#### Plate Specifications Heavy

Pittsburgh, July 10.—Prospects of price regulation in this country, victories gained by the Russians in eastern Europe and reports of internal trouble in Germany have contributed to make the market for finished steel commodities extremely quiet. Scarcely any new buying of a domestic character is reported. Mill managers say specifications against contracts are just about equal to shipments, which means that the situation is much easier than it was a few months ago. Direct and indirect demands of the government are becoming heavier rapidly. Before the end of the year, it is likely that rolling mills in this district will furnish more than 100,000 tons of plates a month for the building of naval and merchant ships. Ordinary tank plates are commanding as high as 11c, and ship plates are selling at considerably above that figure.

#### Makers Turn Down Large Tonnages

Chicago, July 10.—Practically no plates are being sold in the Chicago district. The shipbuilding and other government programs are taking a considerable portion of the output of mills and little tonnage is available for other interests. Tank plates are quoted at 10.19c, Chicago, but inasmuch as practically no sales have been made, this figure is hardly indicative of the state of the market. One interest was forced to turn down inquiries for more than 7000 tons of plates last week.

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The Wickwire Steel Co., Buffalo, expects to place a new open-hearth furnace in operation before the end of July.

# Scrap Recession Extends

## Dull Market Develops in All Districts and Prices Move to Lower—Washington Talk Unsettles

Chicago, July 9. — A period of apathy seems to have settled upon iron and steel scrap in this district as very little buying is reported. The market seems to be at a standstill probably due in part to the fact that mills are making repairs to their equipment during the month of July. Few mills are devoting the entire month to repair work but operations have been suspended sufficiently enough to curtail somewhat the buying of old material. Prices generally have receded slightly. A fair tonnage of shoveling was sold to a Sharon, Pa., consumer for $44, delivered. Another sale to an eastern consumer called for a considerable tonnage of No. 1 railroad wrought. Stocks of raw materials on hand at the mills generally are low and buyers are expected to start shortly to purchase supplies to carry them through the winter. Offerings of miscellaneous scrap by the railroads amount to a little over 10,000 tons. Among the lists offered by these companies is one of 1350 tons by the Union Pacific, another of 5340 tons by the Atchison, Topeka & Santa Fe, and one of 1160 tons by the Minneapolis, St. Paul & Sault Ste. Marie. Other offerings vary from 200 to 900 tons. These lists include nearly all classes of iron and steel scrap.

### Market Almost in Doldrums

Pittsburgh, July 10.—Iron and steel scrap merchants, with few exceptions, have not bought any tonnage for a fortnight or longer, and it is not believed they will figure in the market until prices recede to the basis of about $40 a ton for heavy melting steel. Consumers say, however, they are unable to buy this grade at less than $45, delivered. Generally, the market is quieter than it has been at any time this year. Heavy demand exists for wrought scrap for eastern delivery and machine shop turnings, borings and cast scrap are active. The Pennsylvania railroad is asking bids on rather heavy tonnages of miscellaneous grades at its several shops in this district.

### Easier Condition in East

Philadelphia, July 10. — Although a few scattered sales of certain descriptions have been made at higher prices, the iron and steel scrap market, as a whole in this district is dull and reflects an easier tendency. The principal cause for this is the uncertainty as to how proposed regulation of prices will be affected by the government. Then, too, as a result of the recent heavy buying, consumers are pretty well covered. This is particularly true in heavy melting steel. While Pittsburgh dealers still are willing to take more steel here at $40 to $41, delivered, the tonnages wanted are comparatively small and these prices unattractive. The only new sales of heavy steel here involved several small tonnages for an eastern Pennsylvania consumer at $38, delivered. Small lots of rerolling rails have been sold as high as $55, a small tonnage of shafting went at $55 and a tonnage of car wheels at $45. These prices are higher than the general level at present. Demand for some grades, including yard wrought is so dull that it is almost impossible to sell them.

### Watching the Embargo

Buffalo, July 10.—The past week has seen a quiet market in scrap commodities. There has been a marked letup in the buying of heavy melting steel by the heavier consumers. The government's intention to embargo exportation of scrap July 15 is having a restraining effect. Developments in this connection are being awaited. This embargo, local interests hold, will be practically a counter-embargo to the one the Canadian government instituted on the exportation of scrap from that country. Interests say the main effect of the embargo, though it embraces exportations to foreign countries will be on Canadian trade. There has been a particularly increased demand for heavy axle turnings during the week, strengthening the market in this grade considerably and resulting in an advanced quotation. Trading in the other classes has been comparatively light.

### Dullness Envelopes Market

Cleveland, July 10.—Neither dealers nor consumers appear anxious to do much trading, and there is every indication that the annual summer dullness, generally most pronounced during July and August, has set in. Present inactivity of the scrap market is due mainly, according to one competent observer, to three conditions: First, a slump is always bound to follow such activity as characterized the market in recent weeks; second, prolonged uncertainty as to what Washington is going to do about price control; third, the usual dullness attendant upon July, when the vacation season is in full blast. Heavy melting steel is quoted here at $41 to $42, with comparatively little trading. Dealing is not heavy in any of the other grades.

### Cincinnati Market Weakens

Cincinnati, July 10.—The market is weaker and sales are few and far between, except the small tonnages of cast scrap going to foundries. One dealer reports inbound shipments as now far exceeding outbound shipments, though this does not seem to be the general condition with other dealers. Wrought scrap now seems to be softer than cast, which is the reverse of the situation a few weeks ago.

### Feverishness Has Subsided

St. Louis, July 11.—The scrap market has lapsed into relative quietness, after the excitement and feverishness of the past two months. There is a decided disposition on the part of both dealers and consumers to refrain from taking big tonnages at the present range of prices because of the uncertainties. Quotations largely are nominal, but prices have been marked down on many items from $2 to $4 as compared with recent high levels. Consumers are taking only enough scrap to supply immediate needs. Dealers say the lull is only temporary. They point out that scrap is still extremely scarce, and railroad lists continue insignificant. Country offerings are virtually nil, and the only railroad lists before the trade during the week were as follows: Kansas City Southern, 200 tons; Union Pacific, 300 tons; Wabash, 500 tons, and a small open list from the St. Louis & San Francisco.

### South is Unaffected

Birmingham, July 10.—Ordinarily reports of weakening market in other centers have immediate effect in Birmingham, but the contrary appears to be a fact now in old material. Dealers in scrap here have but little material to sell and the receipts are such as to make it impossible to take on any heavy contracts. Additional advances are noted in some grades. Heavy melting steel holds firmly around $24 to $26, while No. 1 machinery is at $27.50 to $28.50. Car wheels at $30 and tramcar wheels at $27 show strength. Stove plate, which was selling around $10 and $12 several weeks ago, now commands $18 to $19.

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Iron ore deposits in the locality of Eureka Springs, Ark., now are being worked.

# Structural is More Active

### Government Projects Continue Numerous and New York Municipal Work Again Appears in Market

New York, July 10.—Structural steel tonnages, both placed and pending, have been of larger proportions in this district during the past week than for some time past. This improvement is due mainly to the requirements of the government and of industrial companies, in addition to the large tonnages which are wanted for municipal work in New York City. This includes 1200 tons for the proposed Park avenue viaduct on which the city now is taking bids. The American Bridge Co. was the only bidder last week on 3800 tons for the Culver rapid transit extension now under consideration by the Public Service commission. The failure of other fabricators to bid on this project is assigned to the difficulty in securing steel for work of this character. The shape market continues unchanged. The minimum price on plain structural shapes is 4.50c, Pittsburgh, on tonnage taken for shipment at the mills' convenience, or in from nine to twelve months. Small tonnages for preferred delivery are going around 5c, Pittsburgh, and contracts for specification over the next few months continue to be booked by one maker at 6c, Pittsburgh.

#### Projectile Plant Steel Wanted

Philadelphia, July 9.—Government requirements and extensions to war munition and other industrial plants for the construction of cars, etc., continue to contribute most of the activity in the structural steel market. Demand of this character shows no let-up and it is larger than the mills can fill. The largest government job now up involves 2400 tons for the projectile plant at Charleston, W. Va. The Virginia Bridge & Iron Co. has taken 600 tons for an extension to the erecting shop at the Washington navy yard. Prices on plain shapes continue between 4.50c and 6c, Pittsburgh. The lower figure is minimum on mill delivery and the maker naming it is sold up practically through the first quarter of 1918. Small tonnages for preferred delivery continue to go around 5c, Pittsburgh. A leading maker continues to take contracts at 6c for nearby specification.

#### Fabricators Running Full Tilt

Pittsburgh, July 10.—Although fabricators in this district have not taken any domestic orders recently, plants are being driven at capacity to meet demands of the government and industrial interests in all sections of the country. Just how important a factor the government will be in the market the remainder of the year no one seems to know, but indications are that direct and indirect shipments to the nation will increase steadily. Structural shapes are being held at 6c by one mill in western Pennsylvania for delivery at its convenience. Not much material has been sold recently in the open market. Specifications and shipments are about equal.

#### Few Inquiries Reach Fabricators

Chicago, July 9.—Outside of contracts for the various government programs, very little activity is experienced in the Chicago structural market. The quotation of 6.19c, Chicago, prevails firmly and makers seem reluctant to accept orders for steel for ordinary building purposes. The high prevailing prices preclude a great deal of normal building and industrial expansion and fabricators predict that but little of this kind of business will be placed until there is a price adjustment. Books for 1918 delivery remain closed.

#### CONTRACTS AWARDED.

Boot tanks for elevator for the Northern Central railroad at Baltimore, 173 tons to the American Bridge Co.

Addition to roaster building for the Ohio & Colorado Smelting & Refining Co., 120 tons to the American Bridge Co.

Lowe avenue substation for the Commonwealth Edison Co., Chicago, 143 tons to the Gage Structural Steel Works.

Elevator for the Northern Central railroad, Baltimore, 1167 tons to Christopher Simpson.

One beam and six plate girder spans for Great Northern railway, 270 tons to the Wisconsin Bridge Co.

Addition to the boiler house of the Consolidated Gas, Electric Light & Power Co., Baltimore, 400 tons, to the Chesapeake Iron Works.

Building at Twelfth and Chestnut streets, Philadelphia, 800 to 1000 tons to Guerber Engineering Co.

Extension to erecting shop at Washington navy yard, 600 tons, to Virginia Bridge & Iron Co.

Storehouse, hangars and other buildings for government at St. Julians Creek, Va., and Pensacola, Fla., 840 tons, to McClintic-Marshall Co. and 150 tons to the Richmond Steel Co.

Buildings for Anaconda Copper Co., Great Falls, Mont., 600 tons, to an independent fabricator.

Pier shed, Brooklyn, 400 tons, to American Bridge Co.

Bridges for Pennsylvania railroad, 140 tons, to Phoenix Bridge Co.

#### CONTRACTS PENDING.

Projectile plant for the United States government at Charleston, W. Va., 2400 tons, bids being taken.

Extension of the Culver rapid transit line, Brooklyn, 3800 tons, bids being taken by the Public Service commission.

Two additional buildings for the Staten Island Shipbuilding Co., 400 tons, bids being taken.

Bridges for the Pennsylvania railroad, 950 tons, bids being taken.

Magazine buildings for the United States government at Lake Denmark, N. J., 300 tons, bids being taken.

Addition for the National Sugar Refining Co., at Yonkers, N. Y., 800 tons, bids being taken.

Building at Broad and Brown streets, Philadelphia, 150 tons, bids being taken.

Park avenue viaduct, New York, 1200 tons, bids being taken by city.

Addition for New Jersey Zinc Co. plant, Palmerton, Pa., bids being taken.

Extension for Anaconda Copper Co., Butte, 200 tons, bids being taken.

Ammunition buildings for government at Lake Denmark, N. J., 150 tons, bids due July 16.

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# Shrapnel Discards

### Sell at $125, Mill—Sheet Bars Offered at $106, Mill

Cleveland, July 10.—An eastern steelmaker is quoting $125, mill, per gross ton on large rejected shrapnel rounds for immediate delivery for forging purposes. They are in varied lengths and analyses. Sales have been made at that figure. Some users of forging billets have been haunting the yards of scrap dealers and have managed to pick up material well suited to their purpose at $60 to $80 per ton, though not in large quantity.

#### Sheet Bars Offered at $106

Youngstown, O., July 10.—Although the leading valley sheet bar maker continues out of the market and reports as high as $115 a ton for open-hearth bars and $105 to $110 for bessemer can be obtained, one sheetmaker in this territory reports an offer of open-hearth bars at $106. This buyer says he has declined a fair-sized tonnage at this figure. This offer came from the Pittsburgh district. The market for sheet bars in the valley remains closed and is likely to remain so for several months.

#### Pittsburgh Market is Quiet

Pittsburgh, July 10.—Mid-summer dullness features the situation for semi-finished steel products. Scarcely any demand is reported for billets and sheet bars and no large tonnages have been sold recently in the open market. Billets are being held at $100 and sheet bars at $105, Pittsburgh, as a minimum. Forging billets are quoted at $125 by most sellers. Munition makers have figured in the market quietly, but it is not known how extensively. Muck bar is quoted at as high as $90. Wire rods are commanding $95 to $100.

# Hanna Takes Hill Lands

### Leases Bulk of Hill Properties in Minnesota—Latter Company Practically Retires From Ore Market

M. A. Hanna & Co., Cleveland, have taken over the bulk of the Hill ore properties on the Minnesota ranges. Together with the recent leases to the Jones & Laughlin and Inland steel companies, this transaction practically removes the Hill interests from the ore market. They are said to retain only about 15 per cent of their original holdings, this ore being largely low-grade. The Hanna company has been ore agent for the Hill interests for some time.

The Hanna lease includes the operating mines, those now under development and some properties on which no development work has been done. The tonnage involved is said to aggregate between 40,000,000 and 50,000,000 tons. The going properties are principally those which the United States Steel Corp. operated before surrendering its famous Hill lease. The old Steel corporation mines involved are the Harold, Leonard, Mississippi, North Uno, South Uno and Thorne. The Hill interests have mined 2,315,290 tons of ore from these properties since their return by the Steel corporation. Other properties involved are the Fay, Wabigon, Dale and Feigh.

The Hanna company will handle the new mines under the recently organized subsidiary, the Hanna Ore Mining Co. J. D. Ireland, who has been in charge at Duluth of the Hanna mines, will be general manager, and E. E. Hunner, formerly with the Arthur Iron Mining Co., the Hill mining organization, will be assistant general manager.

The Arthur Iron Mining Co. was organized by the Hill interests immediately after notification by the Steel corporation of its surrender of the Hill lease. Active steps were taken to continue the operation of developed mines and to bring other properties to the producing stage. A number of new properties were developed at the same time that new leases were negotiated with various independent interests, including the Tod-Stambaugh Co., Butler Bros. and others. Recently the Jones & Laughlin and Inland leases were announced. The Hill interests also had found that sales of ore were restricted by shortage of vessel space and acquired a substantial interest in three bulk freighters now under construction. The first of these has just been launched. It is understood that the Hanna company has taken over the Hill interests in these vessels.

Recently, interests affiliated with the Hill properties incorporated the Grant Mining Co. The future plans of this company have not been disclosed but it is believed that plans ultimately will be taken to place some of the remaining properties on a producing basis.

# June Output of Steel, Pig Iron and Ore

## Pig Iron Output

FIGURES COMPLETE FOR COUNTRY EXCEPT THREE COMPANIES WHOSE OUTPUT IS ESTIMATED

| | Total | Daily average | Relative production Jan. = 100 per cent |
|---|---|---|---|
| Jan. | 3,159,839 | 101,930 | 100.00 |
| Feb. | 2,649,935 | 94,641 | 92.85 |
| March | 3,255,813 | 105,026 | 103.04 |
| April | 3,319,809 | 110,936 | 108.84 |
| May | 3,413,677 | 110,119 | 108.03 |
| June | 3,260,234 | 108,675 | 106.62 |

June showed a reversal in the comparative rate of operations of the country's steel-producing furnaces and blast furnaces. In May the steelmaking units maintained a higher rate of output than the blast furnaces. Last month, however, the latter operated much closer to their May rate of output than the steel-producing furnaces.

The production of steel ingots in June by those companies which have furnished THE IRON TRADE REVIEW with their production records for each of the first six months of the year, was 1,193,115 tons. The same furnaces produced 1,304,984 tons in May. The loss of 111,869 tons is partially accounted for by the shorter month. On the basis of the average daily output, these steel-producing furnaces turned out 39,770 tons daily during June and 42,096 tons daily during May. The loss of 2326 tons represents a decline of 5.5 per cent from the May output.

The pig iron production in June was 3,260,234 tons against 3,413,677 tons in May, a loss of 153,443 tons. On the basis of average daily output, the loss last month was 1444 tons, or 1.3 per cent. The pig iron figures are complete for the coke and anthracite blast furnaces of the country with the exception of the records of three companies—Pittsburgh Steel Co., Kelly Nail & Iron Co., and the Red River Furnace Co.—whose output is estimated.

The accompanying tables give a clear insight into the relative rates of operation of the steel-producing and blast furnaces during the first half. In the smaller tables, January is taken as 100 per cent so that the comparative degrees of activity during each of the first six months can be found at a glance. These tables show that on this basis the June ingot output was 106.05 per cent and the pig iron output 106.62 per cent.

Supplementing the pig iron and steel statistics, it is interesting to recall that June set an encouraging record in regard to the shipments of iron ore. Despite the handicaps experienced in the first half of the month, the Great Lakes fleet loaded more ore last month than in June, 1916. As a result, the decrease in 1917 shipments, compared with those in the corresponding period last year, was less on July 1 than on June 1.

## Steel Ingot Output

FIGURES FURNISHED BY SAME COMPANIES

| | Total | Daily average | Relative production Jan. = 100 per cent |
|---|---|---|---|
| Jan. | 1,162,503 | 37,500 | 100.00 |
| Feb. | 1,029,436 | 36,765 | 98.04 |
| March | 1,243,547 | 40,114 | 106.97 |
| April | 1,178,992 | 39,300 | 104.80 |
| May | 1,304,984 | 42,096 | 112.26 |
| June | 1,193,115 | 39,770 | 106.05 |

## Monthly Production of Steel Ingots in First Half

FIGURES FURNISHED BY SAME COMPANIES

| | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Basic open hearth | 911,019 | 799,246 | 981,743 | 947,843 | 1,035,019 | 953,571 |
| Acid open hearth | 43,187 | 37,993 | 42,377 | 40,053 | 49,105 | 40,301 |
| Bessemer ingots | 202,971 | 187,351 | 212,765 | 184,607 | 214,282 | 192,521 |
| Electric ingots | 5,326 | 4,846 | 6,662 | 6,489 | 6,578 | 6,722 |
| | 1,162,503 | 1,029,436 | 1,243,547 | 1,178,992 | 1,304,984 | 1,193,115 |

| | |
|---|---|
| June daily average | 39,770 |
| May daily average | 42,096 |
| April daily average | 39,300 |
| March daily average | 40,114 |
| February daily average | 36,765 |
| January daily average | 37,500 |

# Bar All Iron and Steel to Enemy

## President's Embargo Proclamation Designed to Cut Off Reexporting of American Mill and Other Products to Germany—Sweden Looked Upon as Chief Offender—Japan May Lose Ship Steel

WASHINGTON, July 10.—Evidence in the possession of the United States government that neutral countries have been re-exporting iron and steel products from America to Germany has prompted President Wilson to issue his sweeping embargo proclamation, effective July 15. Beginning with that date shipments of all kinds from the United States will be permitted only through licenses issued to producers by the recently created export council under the jurisdiction of the department of commerce. The embargo applies to 56 nations and their possessions, including the allies, neutrals and enemy countries. In addition to foodstuffs included in the embargo list are coal, coke, fuel oils, kerosene, gasoline, pig iron, steel billets, ship plates and structural shapes, scrap iron and scrap steel, ferromanganese, arms, ammunition, explosives and fertilizers.

While the scope of the proclamation is more far-reaching than was anticipated, it signifies the taking of a necessary war measure which is designed to shut off helpful exports to enemy countries. No difficulty will be experienced in exporting materials to allied countries, although in certain instances it has been intimated that these may be cut down as in the case of ship steel to Japan, which has been importing this product heavily from the United States. This country naturally is to be given first consideration. Second preference is to be given to allied countries.

### To Dictate World-Wide Shipping

Through control of coal and fuels, the United States government will take a vigorous hold on shipping. Vessels now plying in trade lanes not considered necessary to a successful conclusion of the war will be compelled to enter trade regarded more essential. Ships now held in port through fear of submarine attack will be required to go into service. The result, in brief, will be that the United States and England, taking absolute control of the seas, will dictate the terms of worldwide shipping, the effect of which may be extremely sweeping, not only on the central powers, but on small neutrals. It is the intention of the United States government, however, to work no avoidable hardships on neutral countries. At the same time it is proposed that they shall cease re-exporting American products to Germany.

### How Export Licenses Can Be Obtained

First, applications for licenses may be made by the bureau of foreign and domestic commerce, division of export licenses, 1435 K street, Washington, D. C., or to any of the branches of the bureau of foreign and domestic commerce—New York, Boston, Chicago, St. Louis, New Orleans, San Francisco and Seattle.

Second, in applying for a license to export any of the commodities covered by the President's proclamation, applicants should give the following information in triplicate form:

a. Quantity.
b. Description of goods.
c. Name and address of consignee.
d. Name and address of consignor.

Third, the license will be good for only 60 days, and at the expiration of that time must be renewed, and if not shipped within that time a new application must be made.

Fourth, the various branch offices of the bureau of foreign and domestic commerce have been given full instructions as to the disposition of all applications for licenses.

In case exporters desire they may telegraph their applications direct to the bureau of foreign and domestic commerce, division of export licenses, 1435 K street, Washington, D. C.

Sweden in particular, it is claimed, has been doing this, especially with regard to general war materials, including iron ore. A report made to this government says that iron ore shipments from Sweden to Germany have reached a total of 9,000,000 tons in the last two years. In 1913 Sweden exported to all countries 6,440,000 tons and in 1914, 4,681,000 tons. During the first quarter of the present year, it is stated in the report, Sweden imported from the United States 16,000 tons of pig iron, and in addition sold large quantities of her own production to Germany. Her pig iron exports to all countries in 1913 were 186,000 tons and in 1914, 162,800 tons. Her pig iron sales to Germany during the last two years are said to have amounted to 250,000 tons. In addition, Sweden is reported to have sold to Germany 15,000 tons of ferrosilicon and ferromanganese, together with large quantities of copper, zinc, manganese ore and other ores. Sizeable tonnages of ball bearings are also said to have been shipped from Sweden to Germany.

Distribution of shipments from this country will be determined, it is believed, through conferences between this government and representatives of the allied governments. After supplying itself first, and then its allies, the government is expected to prorate shipments of all kinds to neutral countries based upon what is conceived to be their actual needs, thus excluding shipments to enemy nations. A complete embargo on wheat probably will be the first step taken, with distribution to allied countries to be apportioned perhaps under the food administration of which Herbert Hoover is administrator. Competition thus will be ended, and through the central purchasing board to be established, prices will be made upon a uniform basis, which, it is expected, will ultimately extend to iron and steel and other products for this government and its allies.

### Japan a Heavy Purchaser

It has been claimed that one reason for the embargo on iron and steel products, together with alloys, was necessary because of tremendous demands being made on the industry in this country. Japan's heavy purchases of ship steel are said to have made it necessary that structural material be put on the embargo list. Incidentally, this embargo may compel Japan to release ship tonnage into the transatlantic trade.

Specific regulations governing shipments of products named in the proclamation probably will be issued within a few days by the President. The exports council, consisting of three cabinet members and the food administration, is preparing a program to be submitted to the President for consideration, wherein regulations regarding the control of shipments will be dealt with.

# Excess Profits Tax Brings Protest

### Graduated Levy Bears Heavily on Productive Industry and Unequally Affects Various Lines of Business—How Iron and Steel and Metal Trades Will Be Obliged to Assume Chief Load

WIN the war and carry the chief burden of the cost in doing so. That is the bill which the iron, steel and metallurgical industries of the country must meet under the scheme of excess profits taxation proposed by the senate revenue act and soon to be passed upon finally by congress.

The measure is designed to raise approximately $1,650,000,000. The manufacturers of steel alone will pay not less than $300,000,000 to $350,000,000 of this amount if the proposed graduated tax is carried out. Such a tremendous levy is indicated by the combined estimated earnings before dividends for the year 1917 of seven of the leading steel companies of the country upon which the graduated scale has been computed.

These seven companies representing perhaps 30,000,000 tons of annual ingot capacity or about 70 to 75 per cent of the capacity of the entire country will pay not less than $205,000,000 as excess profits into the war chest. The probabilities are it will be considerably more. At the same time, they and all other steel companies will be expected to make large subscriptions to recurring war loans and pay increased income, state, county and municipal taxes. Furthermore this excess profits tax will be superimposed upon the respective excess profits, income and property taxes paid by the companies producing raw materials for the steel industry, such as iron ore, coke, pig iron, limestone, etc. But this is not all. The iron mills and those merchant pig iron makers whose product does not enter into steelmaking must make the allotted division of their profits in addition to their regular taxes. Then the gray iron and malleable foundries and the countless number of manufacturers connected directly or indirectly with the iron and steel industry will be obliged to bear a heavy tax. Those companies manufacturing military products will be required to pay a graded munitions tax in addition to the other taxes.

In basing a calculation of excess profits, the proposed law presupposes 1911, 1912 and 1913 as average business years. Applied to the iron and steel industry this is virtually accurate; 1911 was a poor, 1912 a fair and 1913 a good year. An average of these three years is considered in the bill as reasonably normal earnings for a single year. Up to $5000 the profits are not taxed. In addition the business is allowed earnings enough to pay 6 per cent on the average capital employed. On profits of 15 per cent or less above the average yearly rate of earnings for the three years, the tax is 12 per cent of the excess; on profits between 15 and 25 per cent above the average, the tax is 16 per cent; on profits between 25 and 50 per cent, 20 per cent tax; between 50 and 75 per cent, 25 per cent tax; between 75 and 100 per cent, 30 per cent tax; between 100 and 150 per cent, 35 per cent tax; between 150 and 200 per cent, 40 per cent tax; between 200 and 250 per cent, 45 per cent tax; and over 250 per cent, 50 per cent tax.

This system as it will work out in actual practice will exempt many corporations earning millions of dollars annually simply because they were prosperous before the war and have maintained or only moderately increased their business since. On the other hand companies which have established themselves on a sound financial footing during the past three years through the process of time and through no effect of the war, will be taxed heavily. Furthermore, many small businesses which have profited greatly from the war will escape taxation under the exemptions stipulated.

These and other glaring inconsistencies and manifest discriminations already have started a stream of protests flowing into Washington from representative business men, chambers of commerce and trade organizations.

## How Steel Companies Will Be Taxed on Excess Profits

| Company— | Profits Before Dividends 1911 | 1912 | 1913 | Prewar Average | Estimated 1917 Earnings | Probable Tax Yield |
|---|---|---|---|---|---|---|
| United States Steel Corporation... | $55,300,297 | $54,240,049 | $81,216,986 | $63,585,777 | $420,000,000 | $145,960,349 |
| Bethlehem Steel Corporation..... | 2,038,979 | 2,063,640 | 5,122,703 | 3,075,108 | 66,000,000 | 29,222,362 |
| Republic Iron & Steel Co..... | 1,953,442 | 2,233,576 | 3,101,300 | 2,429,439 | 21,000,000 | 8,310,178 |
| Inland Steel Co..... | 1,438,875 | 886,291 | 1,731,294 | 1,352,153 | 15,000,000 | 6,244,663 |
| Lackawanna Steel Co..... | 82,803 | 1,008,811 | 2,675,557 | 1,255,722 | 18,000,000 | 7,910,732 |
| Pittsburgh Steel Co..... | 1,081,506 | 1,300,289 | 1,193,670 | 1,191,855 | 6,000,000 | 1,065,026 |
| Crucible Steel Co. of America..... | 2,557,518 | 3,424,996 | 4,905,886 | 3,629,467 | 20,000,000 | 6,640,473 |
| | | | | | $556,000,000 | $205,354,183 |

# Conference Held

### Between Steelmakers and Government Over New Price Arrangement

Washington, July 11.—All the members of the American Iron and Steel institute's iron and steel committee, at the request of Secretary of War Baker, arrived here last night to confer with the war and navy department heads on the steel requirements of the government for war purposes over the immediate future. The conference, it is understood, is to be held primarily to determine prices at which the government will obtain its steel. The new prices will apply in addition to future requirements, to a large amount of tonnage which already has been distributed for government work and which was in excess of, or not included in the original 610,000 tons furnished to the government at 2.50c, for shapes and bars and 2.90c for plates.

The conference between iron and steel makers and government representatives took on added significance by virtue of the fact that it followed a discussion which the President had with members of the advisory commission and the council of national defense on Monday regarding price disagreements with steel and other producers. It was suggested at the conference that it would be advisable to submit to the commission the complex problems now being faced by the government as to the matter of getting supplies and the prices to be paid for them. The advisory commission in its present form is without specific authority except as an organization that gives expert advice and makes recommendations.

The suggestion is being considered that the President shall delegate some of the powers vested in him by congress to the commission, giving it necessary effectiveness to its conclusions and enable it to more efficiently and quickly mobilize industry and prevent the constant haggling between government representatives and the business interests which is hampering the conduct of the war.

# Large Portion

### Of Cast Iron Capacity is Needed for Government Contracts

New York, July 10.—Outside of a continuation of the improvement in private buying which was reported a week ago, the cast iron pipe market in this district is devoid of any features of importance. The largest public requirements in prospect in this district involve the pipe to be required in connection with the army cantonments to be constructed by the government at Wrightstown, N. J., and Yaphank, L. I. No estimate of the tonnage yet has been made. An additional tonnage is expected to be let shortly for installation at the cantonment at Ayer, Mass. Prices continue unchanged at $65.50, New York, for 6-inch class B and $58.50 for 4-inch class B.

### Pipe Mills Are Swamped

Pittsburgh, July 10.—Manufacturers of iron and steel pipe, virtually all of whom have enough tonnage on hand to maintain present operating rates well into 1918, have adjusted schedules to meet emergency requirements of the government. Rather large tonnages of tubular goods will be needed for cantonments and heavy tonnages of seamless tubing are being purchased for hospital and camp cots. Demand for boiler tubes is extremely heavy.

### High Prices Preclude Buying

Chicago, July 9.—It is estimated that orders placed by the government for cast-iron pipe require from 50 to 60 per cent of shop outputs. Dealers of cast iron pipe report a lessening of demand from the customary consumers such as municipalities. Bids for 900 tons of 4 to 12-inch pipe for water works improvements for the city of Duluth will be opened July 13.

### Can't Ship Argentine Orders

Birmingham, Ala., July 10.—Inability to get transportation on the big order that was accepted from the Argentine government last year is causing the tonnage to accumulate at the plants of the United States Cast Iron Pipe & Foundry Co. Inspectors from that country are on duty, but no ships are to be had. Inquiries for cast iron pipe still are numerous.

# The Non-Ferrous Metals

**Copper** **Lead** **Spelter** **Tin**

New York, July 10.—Extreme inactivity has prevailed in the metal markets the past week. Following the extended period of light demand, prices of most of the metals have shown signs of weakness. Underlying the entire market situation is doubt as to what arrangements the government will make, relative to its requirements for munition purposes. Such arrangements as have been made have only been for specific tonnages and the entire question is almost as nearly unsettled now as it was a month ago.

No announcement has been made by the tin committee appointed by the American Iron and Steel institute and the trade does not know what arrangements will be made for the distribution of tin arriving in this country. Spot Straits tin has advanced about ¼c in an inactive market the past week, closing about 62.75c, New York, today, compared with 62c a week ago. Banca and Billiton are quoted about 60.87½c to 61c.

The lead market has eased off considerably since the lead committee of the advisory commission of the council of national defense arranged to supply the government's needs to Aug. 1 at 8c. Consumers have bought much metal for July shipment, but have not done much business beyond Aug. 1. Some of the leading producers have sold their entire production for July but have booked practically nothing beyond. Lead quotations are as follows: Prompt and July, 11c to 11.12½c, St. Louis; August, 10.87½c to 11c.

Demand for prime western spelter has been almost negligible the past week. With the fixing of lower ore prices several days ago, spelter prices have undergone some readjustment, any position from now up to and including October being available at 9c, St. Louis. Some consumers have been bidding 8.87½c, but no sales at this figure have been reported recently. Brass special is commanding a premium of about ¼c over prime western. A large order for the allies was arranged recently, but this business was closed quietly and details as to price and amount are not yet known in the general trade.

Antimony prices have been on the toboggan. Spot metal was sold at 16c, duty paid, New York, today, as compared with 17.50c a week ago. Prices of future shipments from the far east also have been readjusted, after having been almost stationary for a fortnight. The trade is still in ignorance as to how the government's requirements will be supplied; in the absence of demand, supplies have been pressed on the market without takers and a rapid decline has resulted. Quotations follow: Spot, 16c; June shipment, 15c, in bond; July, 14.50c; August, 14.25c.

The copper market also has eased off perceptibly. Demand has not been active and supplies of July and August metal seem plentiful in the hands of smaller interests, although leading producers are sold up until Sept. 1. Electrolytic quotations follow, on the basis of cash, New York; spot and July, 31.25c to 31.50c; August, 30.25c to 30.50c; September, 29.50c to 29.75c; fourth quarter, 28.75c to 29c. Lake copper is quoted 31c to 31.50c, cash, for prompt delivery. Casting copper is quoted 29.50c to 30c.

Many eastern old metal dealers have been taking mid-year inventories and the market has been extremely quiet. Recently aluminum and lead scraps were in good demand, but following declines in new metals prices, the old metals lapsed into dullness also. Copper scraps are extremely quiet here, although supplies are not coming out very freely and consequently quotations are not dropping as rapidly as might have been expected. Heavy copper crucibled is quoted 27c to 27.25c by leading dealers; zinc scrap, 6.50c to 6.75c; heavy lead, 9.50c to 9.75c; block tin, 52c to 53c; old cast aluminum, 32c to 33c; old sheet aluminum, 37c to 38c.

# The Metallurgy of Ferrochromium

**In This Article, Which is the Third of a Series on Ferroalloys, the Author Describes and Discusses the Manufacture of Ferrochromium and Outlines its Uses**

BY ROBERT J. ANDERSON

FERROCHROMIUM, like ferrosilicon, was one of the pioneer alloys made in the electric furnace at the time when this appliance was first used for the manufacture of ferro-products. As in the metallurgy of other ferroalloys, the technique of ferrochromium manufacture gradually has been improved. As an electric furnace product, ferrochromium is second to ferrosilicon from the standpoint of tonnage turned out. The iron-chromium alloys in early times had the attention of Faraday, Stodarts and Berthier, while Bauer, Fremy, Percy, Mushet and others have been prominent investigators of their properties and uses.

Prior to the introduction of the high-temperature electric-melting furnace, the manufacture of ferrochromium was performed practically entirely in the blast-furnace stack, although a smaller amount was made in the crucible. Crucible manufacture gives high-tenor alloys, but several concomitant disadvantages are present. Only small charges can be fired at a time; the crucible cost is high, as special and expensive pots are required; and the alloys, though rich in chromium, are also comparatively high in impurities, and the product is, therefore, not always satisfactory. For commercial purposes the electric furnace affords satisfactory appliance in which alloys high in chromium tenor and low in impurities can be smelted. The large quantities demanded in steel metallurgy for chromium steel production are now made by the electric furnace in the United States, Germany and elsewhere. Various double carbides of chromium and iron have been isolated by different investigators; these double carbides consist of $Cr_3C_2$ and $Fe_3C$ in varying proportions. The carbide, $Fe_3C.3Cr_3C_2$ was isolated by Carnot and Goutal from a ferrochromium alloy analyzing 59 per cent chromium and 9 per cent carbon, according to Leon Guillet. The same workers showed the presence of the double carbide $3Fe_3C.Cr_3C_2$ in a chromium-bearing steel containing 2 per cent chromium and from 0.5 to 2.00 per cent carbon. Moissan, the French savant, produced the chromium carbide $Cr_3C_2$ in his electric-furnace experiments. According to F. Robin, Williams made 3 $Fe_3C.2Cr_3C_2$ in the electric furnace.

The modern ferrochromium is a high-percentage alloy, containing 60 per cent chromium or more, and the physical properties are directly a function of the amount of carbon present. Thus as regards color, ferrochromium containing 0.5 per cent carbon is bright gray in color, not unlike lead in appearance, while that with 2.5 per cent carbon resembles aluminum, and an alloy containing 5.5 per cent carbon resembles gray iron in color. Ferrochromiums containing less than 5.5 per cent carbon are magnetic, the magnetism varying with the carbon content; while alloys containing 7.5 and 9 per cent carbon are nonmagnetic, according to Keeney.

It is not an uncommon occurrence to hear of cases of disintegration in shipments of ferrochromiums, as with ferrosilicons, but to date no evidence of accidents, either fatal or otherwise, in connection with the evolution of gases from ferrochromiums have been reported. As far as is known to the writer, ferrosilicon is the only ferroalloy which exhibits this phenomenon of giving off noxious and poisonous gases. It has been claimed that the presence of an excess of aluminum in ferrochromium will give rise to a tendency to a spontaneous disintegration accompanied by the evolution of phosphine, $PH_3$. In June, 1910, Copeman, in England, reported that samples of a consignment of ferrochromium from France had disintegrated, evolving an "acetylene-smelling" gas. The samples disintegrated upon exposure to air and moisture, and apparently gave off large quantities of phosphine. However, this shipment had an unusually large percentage of silicon present, and this fact was supposed to be the cause of the crumbling of the material and the concomitant gas evolution. Prior to 1899, or at the time when the electric furnace came into use, ferrochromium was made either in the blast furnace or in crucible pots. Up to the present time it has been made in crucibles, blast furnaces, electric furnaces and by the Goldschmidt thermit process. The latter process can give a carbon-free product of high purity, showing 98 to 99 per cent chromium on analysis. Neumann, Moissan, Keeney and others experimented in the production of ferrochromium by the electric furnace process, and the results of the latter have been set

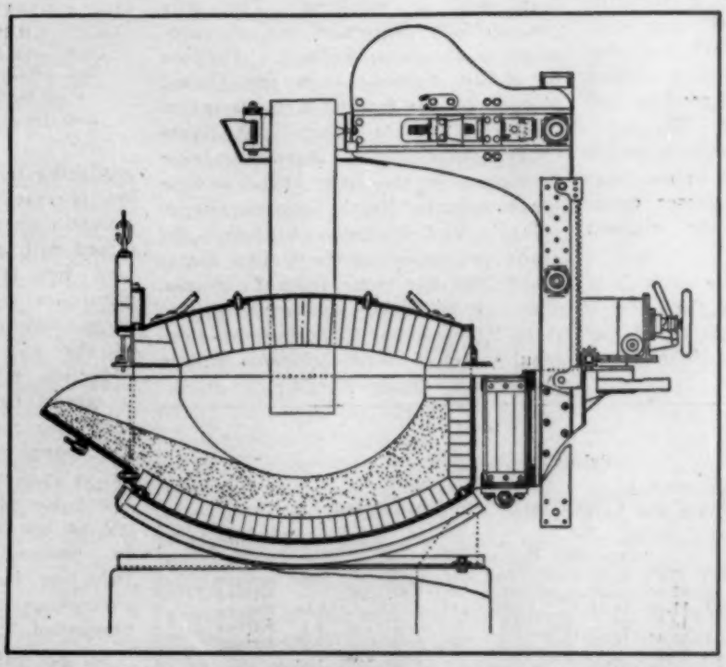


FIG. 1—HEROULT ELECTRIC FURNACE IN WHICH FERRO-CHROMIUM IS MADE

**Table I**

## Analyses of Ferrochromiums

| Kind of alloy | Elements in per cent Cr | Fe | C | Si | Al | Mn | Ca | S | P | Authority for analysis |
|---|---|---|---|---|---|---|---|---|---|---|
| Blast furnace ..... | 30.00 to 40.00 | ..... | 6.00 to 12.00 | .... | .... | .... | .... | .... | .... | Keeney |
| Blast furnace ..... | 41.39 | ..... | 7.12 | 0.21 | .... | 1.84 | .... | .... | 0.052 | Keeney |
| Crucible ..... | 19.80 | ..... | 3.80 | .... | .... | 0.33 | .... | .... | .... | Keeney |
| Electric furnace ... | 54.50 | 22.00 | 9.50 | 2.25 | 0.80 | 0.15 | 0.25 | 0.04 | 0.03 | Carnegie |
| Electric furnace ... | 60.90 | 31.60 | 6.10 | 1.10 | .... | .... | .... | .... | .... | Moissan |
| Electric furnace..... | 63.50 | 35.00 | 0.60 | 0.20 | 0.10 | 0.10 | 0.35 | 0.03 | 0.02 | Carnegie |
| Electric furnace..... | 63.50 | 21.50 | 7.50 | 5.80 | 0.80 | 0.15 | 0.25 | 0.04 | 0.03 | Keeney |
| Electric furnace..... | 64.00 | 28.50 | 5.50 | 0.40 | 0.50 | 0.15 | 0.25 | 0.04 | 0.03 | Keeney |
| Electric furnace..... | 64.00 | 31.00 | 3.50 | 0.30 | 0.40 | 0.15 | 0.30 | 0.04 | 0.02 | Keeney |
| Electric furnace..... | 64.50 | 22.00 | 9.50 | 2.25 | 0.80 | 0.15 | 0.25 | 0.04 | 0.03 | Keeney |
| Electric furnace..... | 68.24 | ..... | 1.00 | 1.85 | 0.50 | .... | .... | .... | .... | Rossi |
| Electric furnace..... | 70.96 | 23.23 | 5.21 | 0.50 | .... | .... | .... | 0.078 | 0.008 | Scholl |
| Electric furnace..... | 96.00 to 98.00 | 2.00 to 3.00 | 0.75 to 1.25 | 0.05 to 0.75 | .... | .... | .... | .... | .... | Harbord and Hall |

forth in several writings in current technology.

Only a small amount of ferrochromium is made in the blast furnace at the present writing for the reason that the electric furnace is a more efficient appliance, where the power cost is low; and further, the electric furnace turns out a better product. When ferrochromium is made in the blast furnace, it requires a heavy fuel consumption for its successful manufacture. About three tons of fuel per ton of the 40 per cent alloy are used. The blast furnace product is normally rather high in combined carbon and may contain sulphur. According to Keeney, theoretically, it should be possible to secure a ferrochromium containing 65 per cent chromium from a chromiferous ore containing 60 per cent $Cr_2O_3$ and 20 per cent FeO, but usually the result is an alloy analyzing about 30 to 40 per cent chromium and 6 to 12 per cent carbon. The modern method of making ferrochromium then, as already stated, is in the electric furnace, although a lesser quantity is produced by the thermit method.

Generally speaking, the iron-chromium alloy produced in the electric furnace analyzes about 60 to 65 per cent chromium and from 5 to 9 per cent carbon. This product may receive a subsequent refining and decarburization on treatment, which gives a low carbon alloy. Analyses of ferrochromiums are given in Table I. As may be noted, the impurities in the electric furnace alloys are normally quite low; the carbon may vary from 0.60 to 9.50 per cent dependent on the amount of this element desired in the alloy.

### *Where Chromite is Found*

The raw materials used in chromitic smelting are chromiferous iron ore, or chromite, and anthracite coal, coke or charcoal as a reducing agent. Chromiferous iron ores from Canada, Cuba, Turkey, New Caledonia, New South Wales and California have been used in smelting. The only commercially important ore of chromium is chromite, $FeCr_2O_4$. The ore is widely distributed in the United States, being found particularly in California, in Monterey and Santa Clara counties; in Maryland, near Baltimore in the Bare Hills; and in Massachusetts, North Carolina, Pennsylvania and Wyoming. Almost the entire production in the United States since 1880 has come from California. The ore is mined also at Brusa, in Asia Minor, about 60 miles from Constantinople; in New Caledonia and in the Urals. Canada has turned out increased tonnages in late years; ore is found at Bolton and Ham, Quebec, Canada. Chromite occurs in basic igneous rocks like gabbros and peridotites, particularly those containing olivine; these rocks readily decompose to serpentine, so that much chromite is taken from serpentic rocks. Typical analysis of chromiferous iron ores used for smelting are given in Table II.

**Table II**

## Analyses of Chromiferous Ores

| Kind of ore | Percentage Composition $Cr_2O_3$ | FeO | $Al_2O_3$ | MgO | CaO | $Si_2$ | MnO | $P_2O_5$ | S | $H_2O$ | Authority for analysis |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cuba ..... | 50.0 | 18.57 | 12.44 | 13.38 | 2.16 | 3.82 | .... | 0.45 | 0.69 | .... | Keeney |
| California .... | 52.68 | 15.30 | 11.40 | 16.23 | .... | 3.40 | 0.15 | .... | .... | 0.94 | Keeney |
| Turkey ..... | 51.7 | 14.2 | 14.1 | 14.3 | 1.7 | 3.5 | .... | .... | .... | 0.3 | Keeney |
| Turkey ..... | 52.8 | 10.24 | 10.48 | 13.96 | 2.37 | 0.2 | 0.2 | 0.05 | .... | 1.05 | Keeney |
| New Caledonia. | 55.7 | 13.2 | 16.2 | 9.8 | 0.25 | 6.95 | .... | .... | 0.06 | .... | |

The composition of the ore varies considerably according to the sources, but an average analysis for that used for electric-furnace smelting is: 50 per cent $Cr_2O_3$; 25 per cent FeO; 10 per cent $Al_2O_3$; with CaO, MgO, $SiO_2$, etc., variable within rather wide limits.

Electric furnaces for the production of ferrochromium are similar to either the Siemen's crucible furnace or to the Heroult furnace, as illustrated in Fig. 1. The method of

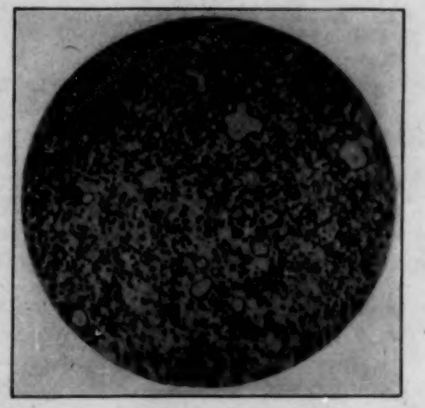


FIG. 2—STEEL CONTAINING 2.74 PER CENT CHROMIUM AND 2.89 PER CENT SILICON; QUENCHED AT 890 DEGREES, CENT; CEMENTITE AND MARTENSITE.
1000 Diameters (After Honda, et al)

producing ferrochromium for the market is essentially as follows: Finely ground chromiferous iron ore is mixed with anthracite coal and shoveled into the furnace around the electrodes, charging being continued at periodic intervals so that the top of the mix remains unfused. The reduction takes place and the alloy is tapped from the furnace into iron receivers, which are dumped when the poured metal freezes. The product is broken and packed in kegs or boxes for shipment. Alloys containing as low as 5 per cent carbon can be economically produced in one reduction, but for higher grade ferrochromiums a subsequent refining is demanded.

In general, the first product contains from 60 to 65 per cent chromium and from 5 to 9 per cent carbon. To

give the low-carbon alloy, this first product is then remelted and decarburized. In refining, the alloy is treated with a mixture of chromiferous ore, fluorspar and lime, the amount used being a function of the impurities to be removed. The alloy is covered with this mixture and heated. It is thus possible to reduce the carbon to as low as 0.25 per cent, but the usual percentage is about 0.5.

Gustave Gin describes the decarburization of ferrochromium as follows:

"When fused carburized ferrochromium is superheated in the presence of an oxidizing slag and the entire mass allowed to cool, it is regularly found that as it cools down the surface of the previously tranquil bath becomes the seat of ebullition, at first slight, but increasing in intensity up to the moment immediately preceding solidification. It is likely that this ebullition is caused by the

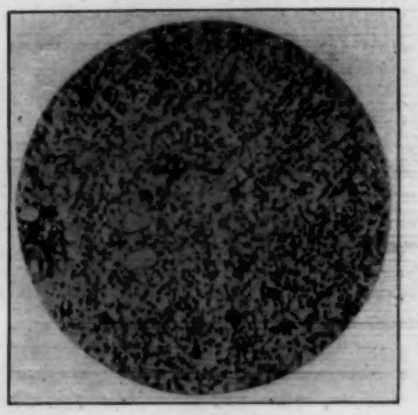


FIG. 3—STEEL CONTAINING 2.74 PER CENT CHROMIUM AND 2.89 PER CENT SILICON; QUENCHED AT 490 DEGREES CENT.; FERRITE AND CEMENTITE
1000 Diameters (After Honda, et al)

disengagement of the oxide of carbon, due to deoxidation of the dissolved oxide by the carbon present in the alloy. It is naturally very difficult to account for these circumstances and the exact causes of the phenomenon, because in any of the observed cases neither the variations of heat of formation of the metallic carbide nor the oxide present are known; nor are the variations of the specific heats of the components and the products within the temperature ranges considered known exactly. We feel, however, that this is an example of the principle advanced by Le Chatelier, that an increase of temperature favors endothermic reactions and a lowering of temperature exothermic reactions."

Rossi, the well-known titanium investigator, has made ferrochromium in the electric furnace containing 68.24 per cent chromium, 1.85 per cent silicon, 1,0 per cent carbon and 0.5 per cent aluminum from an ore containing 50 per cent $Cr_2O_3$. Neumann employed a ferrosilicon containing 91.65 per cent silicon and 1.03 per cent carbon, as a reducing agent for the production of ferrochromium. His product analyzed 38.05 per cent chromium, 2.53 per cent silicon and 0.87 per cent carbon. Moissan made ferrochromium in the electric furnace by the reduction of chromite with carbon, obtaining an alloy analyzing 60.9 per cent chromium, 31.6 per cent iron, 6.1 per cent carbon, and 1.1 per cent silicon.

Table III

## Analyses of Chromium-Bearing Steels

| Use | Elements in per cent C | Si | Mn | P | S | Cr | W | Mo | V | Authority for analysis |
|---|---|---|---|---|---|---|---|---|---|---|
| Tool steel .... | 1.16 | 2.89 | 0.21 | 0.047 | 0.038 | 2.74 | ..... | ..... | .... | Honda, et al. |
| Tool steel .... | 0.66 | 0.08 | 0.08 | 0.018 | 0.016 | 3.43 | 16.81 | ..... | 0.11 | Honda, et al. |
| Tool steel .... | 0.64 | 0.05 | 0.01 | 0.015 | 0.012 | 3.73 | 14.06 | ..... | 0.11 | Honda, et al. |
| Tool steel .... | 0.82 | 0.18 | 0.26 | 0.003 | 0.016 | 3.71 | 14.63 | 0.017 | 0.20 | Honda, et al. |
| Tool steel .... | 0.59 | 0.22 | 0.06 | 0.028 | 0.023 | 2.86 | 18.81 | ..... | .... | Honda, et al. |
| Axles; side, main and connecting rods ..... | 0.25<br>0.30 | .... | 0.40<br>0.30 | ..... | ..... | 1.00 | ..... | ..... | 0.16<br>0.18 | Stoughton |
| Axles, bolts, hammer rods.... | 0.20 | .... | 0.30<br>0.40 | ..... | ..... | 0.50 | ..... | ..... | 0.12 | Stoughton |
| Car axles, holding bolts, etc. | 0.20 | .... | 0.40 | ..... | ..... | 0.80 | ..... | ..... | 0.16 | Stoughton |
| Wheels, gun barrels, crank pins ..... | 0.45<br>0.55 | .... | 0.80<br>1.00 | ..... | ..... | 1.25 | ..... | ..... | 0.18 | Stoughton |
| Case-hardening steel for parts. | 0.12<br>0.15 | .... | 0.20 | ..... | ..... | 0.30 | ..... | ..... | 0.12 | Stoughton |
| Armor plate... | 0.25 | .... | .... | ..... | ..... | 1.50 | ..... | ..... | Ni 3.25 | Stoughton |

*Chemistry of the Alloy*

Keeney has demonstrated that a chromium steel can be made in the electric furnace directly from hematite and chromite; the control of the carbon in the product by means of the carbon charged is difficult if chromium is present. He also showed that ferrochromium can be readily made directly from chromite in the electric furnace; that the percentage of carbon in the ferrochromium cannot be held low by regulating the amount of carbon charged unless there be high chromium loss in the slag; that the percentage of carbon in the ferrochromium must be regulated by decarburization with an oxide slag of iron or chromite after tapping the slag from the first reduction; that the silicon and phosphorus cannot be held low in the product under the strong reducing action required, and that the sulphur can be caused to readily enter the slag.

In the crucible, chromiferous ore is reduced with carbon, using a flux consisting of lime, borax, fluoride or water glass. The thermit process is one of direct reduction, being dependent for its success upon the strong affinity of oxygen and aluminum, as is well known. The aluminum robs the chromite of its oxygen with the result that chromium is reduced.

A soft ferrochromium has been put out by the Sociéte la Néo-Métallurgie with as low as 0.25 per cent carbon, and the Goldschmidt Thermit Co. makes carbon-free ferrochromium. The Societe has produced a ferrochromonickel containing 16 to 38 per cent iron, 5 to 60 per cent nickel, 24 to 27 per cent chromium and 0.30 to mo-silicon has been made which contained 50 per cent chromium, 8 to 10 per cent silicon, 38 per cent iron and 2 per cent carbon.

The use of chromium in alloy steels has markedly increased, and its employment promises to further increase on account of the special properties it confers upon the metal. It is desirable as an alloying constituent also because it may be introduced with relative ease in the manufacture of alloy steels. In a word, the effect of chromium on steel may be briefly stated as follows: It does not act as a scavenger, removing oxides and occluded substances as do titanium, manganese and silicon, nor does it confer soundness on the steel in the manner of silicon and aluminum. Added in small amounts, it increases the tensile strength of the steel to some extent, without markedly decreasing its ductility; but when added in too large amounts, it causes brittleness. Both of the foregoing effects are dependent upon the amount of carbon present.

Chromium, when added to steel, raises the normal critical range, thus

causing the changes to take place at elevated temperatures and also more slowly. Hence chromium-bearing steels are harder than ordinary steels because quenching more effectively prevents the transformation of the austenite. When added to iron, chromium does not materially harden the metal, and chromium-bearing iron or very low-carbon chromium steel will not harden even when submitted to drastic water quenching. The chromium steels contain from 1 to 4 per cent or more of chromium, and the carbon may range from 0.50 to 2 per cent; such steels are normally employed in the hardened condition. Chromium is commonly associated with nickel or vanadium for special purposes. Table III gives some analyses of various chromium-bearing steels.

Chromium steels are well adapted for use in the manufacture of armor plate and for armor-piercing projectiles, as well as for automobile parts, and in other cases where great hardness and high tensile strength are desired. Chromium steels are employed for making steel tires and springs for railway purposes, file steel, plows, burglar-proof safes, automobile forgings, armor plate and armor-piercing projectiles, tool steels, axles, connecting, side and main rods; transmission parts, crank pins, gears, bolts, wheels, gun barrels, case-hardening steels, and for some other uses. In combination with nickel, chromium forms the now well known chrome-nickel steel of the trade. Recently it has been employed with tungsten for magnet purposes. Photomicrographs of chromium-bearing silicon steel after Honda, Tawara and Takagi are illustrated in Figs 2 and 3.

*Prices and Markets*

As already pointed out, chromite is the base material from which ferrochromium is made. There has existed a state of great scarcity as far as this ore is concerned, because the war, as in many other lines, has exerted a radical effect upon the chromium industry. The countries turning out most of the ores are under the control of Great Britain, and the largest ferrochromium producer was France. From the standpoint of domestic consumption, Macedonian ore has been unavailable for some time because of political troubles, while New Caledonian ore has not been received in any large quantities, so that producers of chromium alloys have been obliged to seek supplies from California and Canada. In 1915, 14,000 tons were shipped from Canada, but this tonnage was of low tenor. In California, work is actively progressing, but the production has been of insignificant amount, when compared to the supplies obtained from outside sources. The production of chrome ore in the United States in 1915 was 3281 long tons, valued at $36,744, according to Mineral Resources.

The scarcity of ore and the increased cost of electric-furnace equipment have combined to force the price of iron-chromium alloys up considerably. Normally chromite sells for $14.16 per ton, f.o.b. cars at railroad shipping point, on a basis of 50 per cent $Cr_2O_3$ content.

# Obtaining Materials for Munitions

BY C. B. NOLTE

AFTER the first two months of the present war General French, of the English army, said: "The problem set is a comparatively simple one—munitions—more munitions—always more munitions." The statement is undoubtedly true to a large extent at least, as it has been brought home to us that munitions certainly do constitute a most important problem in a war of any magnitude; but there are probably many manufacturers in this country today who will not exactly agree as to the simplicity of the problem.

The United States is exceptionally fortunate, however, in the possession of extensive and valuable deposits of the principal metals and materials for explosives required for manufacturing munitions. Of the world's supply, this country normally produces approximately 40 per cent of the coal and iron, 60 per cent of the copper, 65 per cent of the petroleum, 32 per cent of the zinc, and 33 per cent of the lead. It is apparent, therefore, that our domestic supply of the most important raw materials is ample for the manufacture of artillery ammunition, guns, cartridges, and vehicles which probably constitute the class of munitions that is required in the greatest quantity.

The United States government arsenals are entirely inadequate, in time of war, to supply the needed products for war use, and this duty will fall, to a large extent, upon private industries. The amount of munitions that has been supplied during the war is no criterion of the amount that can be produced in this country. Many concerns that have participated in this new industry built entirely new plants for that purpose in order not to interfere with their increasing domestic trade. In addition to innumerable smaller manufacturers, there are over 35,000 manufacturing and equipment concerns in this country, each doing an annual business of over $100,000. Almost every industrial plant has operating equipment suitable for producing some munition part.

The manufacture of shrapnel and other shells does not require special machinery, and car-building and car-material plants, motor car factories, and forge and machine shops are equipped to participate in this work. Watchmaking, typewriter, printing-machinery, office-equipment, scientific-apparatus and electrical factories, as well as many other small machine shops, have been readily adapted to the manufacture of shrapnel and high-explosive fuses. The majority of machinery and locomotive manufacturers have machined shells. In addition, car and locomotive builders can construct field kitchens, ammunition wagons, gun carriages and conveyances. Optical and jewelry factories are producing sights, aiming devices and periscopes.

It requires more special machinery to produce small arms and small cartridges satisfactorily, but even interesting and surprising resourcefulness has been exhibited in the manufacture of these in ordinary plants.

Only powder manufacturers, however, are able to make the necessary explosives. The most important materials used in explosives today are obtained from coal tar, a by-product of coke ovens. Coal tar and its derivatives are produced principally by the various steel companies, and whereas there was but one concern recovering benzol and toluol before the war began, 19 concerns had constructed new plants for this purpose by the end of 1915.

The motor truck has proved to be an extremely necessary part of army equipment; but by means of new jigs and fixtures the many pleasure-car factories, with their ever-increasing outputs, are readily converted into motor-truck factories. Aeroplanes, most

From a paper presented at the Cincinnati meeting of the American Society of Mechanical Engineers, May 21-24, 1917. The author, C. B. Nolte, is in charge of inspection of engineering materials, Robert W. Hunt & Co., Chicago.

important for fire-directing, are now being made upon a commercial basis in this country by more than 12 firms. In addition, there are over 40 factories producing a small number of machines of some special or experimental type which can be standardized in wartime. On account of the short actual flying life of the aeroplane, however, it will be necessary to adopt extreme measures to bring the production to a satisfactory figure.

Since, strictly speaking, munitions include all supplies and equipment necessary in war, with the exception of men and money, only the characteristics of the more important materials can be considered within the limits of this paper.

*The Essential Materials*

The gun proper of the usual field gun is subjected to a suddenly applied pressure of from about 35,000 to 40,000 pounds per square inch and is generally made of nickel steel of over 90,000 pounds per square inch tensile strength, 60,000 pounds per square inch elastic limit, and an elongation in 2 inches of 18 per cent. Rigid inspection and tests of this material are necessary before it is worked. The artillery wheels, springs, hollow axles, and recoil cylinders of field guns are made of ordinary materials used at automobile wheel factories and forge plants.

The two principal types of projectiles are the shrapnel and high explosive shell. The shrapnel body is not intended to break or explode when subjected to an internal pressure of about 20,000 pounds (the force exerted when the charge leaves the shrapnel), and is made of steel with a yield point of from 80,000 to 100,000 pounds per square inch. Further, American shrapnel must, when finally treated, give a tensile strength of, in some types, 110,000 and other 120,000 pounds per square inch, with an elastic limit of 80,000 pounds and 90,000 pounds per square inch, elongation in 2 inches of 15 and 16 per cent, and reduction in area of 40 and 45 per cent, respectively. Steel for this purpose is furnished by the steel mills, and contains carbon from about 0.35 per cent to 0.45 per cent, manganese 0.50 to 0.80 per cent, phosphorus and sulphur not over 0.04 per cent each, chromium 0.70 to 1.20 per cent, vanadium 0.12 to 0.24 per cent.

Shrapnel steel, as produced by the large steel mills in this country, is furnished in three different forms: rough-turned bars, forgings and rolled steel rounds. The latter form has been used with considerable success and exceedingly rapid production.

The ordinary shrapnel fuse is made of several brass parts, the material for which can be produced by modern brass foundries. The usual composition of this material is about 59 to 61 per cent copper, 37 to 39 per cent zinc, and about 2 per cent lead, resulting in a tensile strength of about 45,000 pounds per square inch, elastic limit of 27,000 pounds per square inch, and 30 per cent elongation in 2 inches. The fuse bodies and caps are generally forged, whereas the timing rings and other parts can be cut from brass tubes. The brass cartridge cases which hold the propelling charge for the shrapnel are drawn from brass disks cut from bars rolled by the various brass rolling mills. There is nothing unusual in the specifications for cartridge-case material, copper varying from 66 to 73 per cent, according to different purchasers' specifications, with zinc from 27 to 34 per cent, and with a tensile strength from 43,000 pounds to 54,000 pounds per square inch and an elongation of from 28 to 32 per cent in 2 inches. The usual specification allows a range of 3 per cent in the copper and zinc contents; for example, 69 to 72 per cent copper and 28 to 31 per cent zinc.

The high-explosive shell is made of steel and is intended to break into a large number of pieces upon impact and explosion. It is usually forged from steel rounds, billets and cast ingots, with carbon from 0.40 to 0.55 per cent, manganese 0.40 per cent to 1 per cent, phosphorus and sulphur not over 0.04 to 0.06 per cent each, and silicon from 0.18 to 0.30 per cent. Some of the steel for this purpose also contains nickel not to exceed 0.50 per cent and copper not over 0.10 per cent.

This grade of steel is easily produced by practically all of the large and small steel mills in this country, and, in fact, has been produced already in considerable quantities for such purposes. The fuse for the high-explosive shell does not present the same difficulties as that of shrapnel and is usually made of ordinary steel and copper alloys.

*Inspection of Raw Material Advisable*

The first problem in the procuring of shrapnel, high-explosive shells, fuses and cartridge cases, is the delivery of suitable raw material. Care must be taken, therefore, to secure steel and brass of the proper chemical composition and physical characteristics. In addition to a careful study and understanding of the specifications and drawings, one of the most effective and economical means of obtaining the desired material rapidly and without excessive loss has been found to be by inspection of the material at the rolling mills before it is shipped to the finishing plants, by an experienced and trained organization.

Regarding explosives, the majority of commercial explosives are not suited for use in shells on account of their inability to withstand, without explosion, the shock of firing from the gun. Smokeless powder is produced by special plants which treat cotton fiber with such materials as nitric and sulphuric acid, alcohol and ether. Nitrogen, used in the manufacture of nitric acid, is chiefly derived from the sodium nitrate found in Chile, but European nations are now obtaining a large amount of nitrogen from the air by the fixation process. Pyrites for making sulphuric acid is found in this country, although much of the best is imported from Spain. The United States manufactures ether and alcohol in abundant quantities. Glycerine, a by-product of soap manufacture, is produced in large amount at home. Cordite, the explosive which has come into such great favor because of its combination of propellant and high explosive qualities, is obtained by further treatment of gun cotton and nitro-glycerine with acetone, which is a product of wood distillation and which is also obtained from a special fermentation of starch. Trinitrotoluol is obtained by nitration of toluene, which constitutes about 36 per cent of crude benzol, a by-product of coke.

*Characteristics of Trinitrotoluol*

Trinitrotoluol possesses an explosive force of about 119,000 pounds per square inch, while the explosive force of picric acid is about 135,000 pounds per square inch. Owing, however, to its propellant qualities and the fact that it does not form dangerous salts by combination with iron and other metals in contact, trinitrotoluol is superior to picric acid as a war explosive. Picric acid does yet, however, play an important part in priming compositions and propellant powders. It, too, is obtained from coal-tar derivations.

Although, as has been outlined, the United States is well equipped to furnish the principal materials for munitions, it is apparent that there are many other phases of the problem which it has not been possible to consider here. If the requisites of war are to be successfully met, every industrial worker, whether he be engaged on the farm, in the mine, or in the factory, has an important task to perform; every manufacturing plant has a definite obligation; and all the resources of our country must be systematically brought to their utmost utility.

# Buying Machine Tools in Wartime

## How the Machinery Which Makes Munitions and Supplies for the Military Forces is Purchased—New Methods of Conducting Tool Business Brought About by the War

BY GUY F. CREVELING

IRON and steel are said to be the foundation of modern warfare, but machinery is the cornerstone of the foundation. Machinery is needed to make ordnance, shells, rifles, cartridges, motor trucks, engines, aeroplanes, locomotives—the list is endless. No matter how plentiful supplies of raw materials may be, machinery is essential to transform these supplies into the requisite products. This country's annual steel production may exceed 41,000,000 tons, but the capacity of the country's machinery facilities measures the amount of steel which can be turned to useful account in this war.

*Early Chaotic Conditions*

When the war in Europe began in August, 1914, the United States was leading the world industrially. It had been building machinery for years and its manufacturing facilities had grown apace, all with a view to peaceful pursuits. But the war inspired urgent demand from munition-makers in this country and abroad, for tools. England and France immediately came to this country for machinery to equip the plants which were to make those nations vast arsenals. During the first portion of this period of preparation, conditions were much confused. But gradually organizations were perfected until now the buying of machinery by the British and French governments is conducted smoothly and expeditiously.

America's problem, however, has just begun. The country is passing through all the throes of readjustment from a peace to a war basis and the demand for machinery to produce munitions of various kinds, aeroplane and marine engines and shipyard machinery is greater than builders can meet. Some machine tool plants are filled up with orders for the allies and for the United States government for more than a year ahead. The authorities at Washington consider that the allies constitute our first line of defense. Consequently the government has issued instructions to machinery builders to give preference to important orders for the allies. Cases are known of tools being built for neutral Scandinavian countries, preference having been given over United States government work because the buyer needed the equipment to complete British contracts.

Speed is the vital element and now the American government is receiving preference over neutral governments and over private commercial buyers in this country. Frequently tools are being requisitioned or contracts canceled. Some of the red tape gradually is being dispensed with at Washington. While the system of competitive bidding as it prevails during normal times is still being adhered to, it has been narrowed down greatly. Resort to unusual powers resting in government purchasing agencies is being made in order to hasten the supply of necessary equipment. Naturally, the two greatest buying branches of the government are the war and navy departments. The bureau of supplies and accounts purchases most of the machinery and machine tools for the navy department, although the bureau of yards and docks also is purchasing heavily, especially with regard to cranes of all types. The system of purchasing in the war departments is not centralized as it is in the case of the navy department. The principal purchasers for the war departments are the arsenals.

*Buying Methods Are Unique*

It is the custom of the bureau of supplies and accounts at present to make out requisitions for machinery and machine tools and after receiving the approval of Paymaster General Samuel McGowan, the requisitions are sent out immediately to a list of reputable manufacturers of the equipment desired, formal bids being waived. Awards are then made according to the most satisfactory prices offered and delivery assured, the latter point being of particular importance. The bureau has announced that, in connection with regular bids asked, it is necessary, owing to the national emergency, to receive them as soon as possible. The dates of openings specified for the various schedules are the very latest at which bids can be opened, the periods for the opening of tenders being considerably shorter than they are under ordinary conditions. The bureau of yards and docks continues to adver-

### War Transforms Machine Tool Industry

*ONLY too well the machine tool builders and dealers recall the period of stagnation which prevailed in the machinery markets during July and August,* 1914. *Business was at a standstill and inquiries for three or four tools were looked on as a blessing. Early in August* THE IRON TRADE REVIEW *in summarizing the New York machine tool market featured the placing of six tools for installation in a nearby city. "The business was distributed among several dealers." The Pittsburgh market was "dead" and had been so for a year. Cincinnati builders were panicky at the thought of losing their foreign business because of the war which threatened.*

*Toward the last few days of September the eastern tool market was almost stunned when Pratt & Whitney announced the receipt of a* $500,000 *inquiry from abroad. New England tool builders awoke from their lethargy and the race was on, though few of them realized the immensity of the task ahead. Early in October the Cincinnati Milling Machine Co. received an order for milling machines from England, and Cincinnati manufacturers began to get under way, preparing for the great drive which was soon to be launched on American tool builders.*

*Startled by the appearance of a list which appeared in October, calling for* 100 *machine tools for immediate shipment, New York dealers began to forget the lean months of hungry waiting and started to lay in a stock of machinery; tool plants commenced night work, for the first time in many months; inquiries began to flow in by every mail, good inquiries, heavy inquiries and finally immense inquiries calling for* 1000 *to* 1500 *tools. Half-million-dollar orders were appearing frequently and when American steel companies issued lists involving* $2,000,000 *and* $2,500,000 *worth of tools, the greatest buying movement of shop equipment the United States has ever known was on in full blast.*

tise for bids, but also makes many purchases in the open market.

The arsenals issue circulars to listed manufacturers for equipment, the one at Rock Island, Ill., being the chief buyer of machinery and machine tools. Manufacturers have been responding as energetically as possible to demands for early delivery and without complaint have given up more attractive contracts from private concerns.

The requirements made direct by the government for its arsenals, navy yards and ships, are only part of the tremendous demands for machinery and tools to be used for the production of military supplies for its use. Private makers of munitions are expanding their plants or building new ones, and these activities call for heavy orders of machine tools to be used in producing government orders. One large steel plant alone is understood to be spending $18,000,000 out of its own treasury for building an addition to its plant and will require large quantities of machinery and machine tools, for government work. The company, however, will be compensated out of the federal treasury.

*Scale of Government Work*

An idea of the activities of the navy department was given clearly in a statement recently issued by Rear Admiral F. R. Harris, chief of the bureau of yards and docks. He announced that the department is carrying through a building program in the improvement of navy yards, training stations, aviation stations, submarine bases, the erection of immense storage warehouses for supplies and munitions, the construction of dry docks capable of accommodating the largest vessels, gun shops, including the erection at the naval gun plant in Washington of the largest shop of the kind in the world and the erection of hundreds of buildings of the various branches of the services. The program now under way, a large part of which is nearing completion, involves the expenditure of approximately $80,000,000. Usually a program of this magnitude is distributed over a term of years, but this construction is being carried out on an unprecedented scale, and instead of taking three or four years, it will be entirely completed within nine months, some of it already being finished. The program involves the building of structural and machine shops and foundries of the most modern types. The machinery for these buildings is most unusual in character. The crane service is a large step

PAYMASTER GENERAL SAMUEL McGOWAN
Officer Identified with Machine Tool Transactions for the United States

in advance of anything heretofore contemplated. Traveling cranes having a capacity as high as 300 tons are being built, while fitting out cranes with a capacity of nearly 400 tons are planned. The largest cranes of such character ever before built, and these for Germany and England, are only 300 tons.

It is of some interest to compare the buying methods of the United States government with the procedure of the allied governments, especially at this time, when there is talk of the United States government taking

R. POLIAKOFF
In Charge of Machine Tool Buying for Russia

charge of all this work for the allies, in view of its participation in the war. Buying of machine tools for the British and French governments is effected through the efficient purchasing department organized by the allied fiscal agent, J. P. Morgan & Co., to handle this work. T. J. White has charge of the machine tool department of J. P. Morgan & Co. Each government also maintains a commission in New York, to assist and advise technically with J. P. Morgan & Co. in the buying of various supplies. The British commission has offices at 120 Broadway, New York City, under the name E. W. Moir. Mr. Moir founded the commission and originally had charge. At present H. Japp has charge of the commission while E. C. Poultney has charge of the machine tool section. Inquiries issued by the British ministry of munitions are cabled in duplicate to J. P. Morgan & Co. and the commission. The fiscal agents obtain figures from a selected list of manufacturers, consult with the commission and the figures are returned to England for approval before being closed.

*Comparing the Buying Routines.*

At one time the volume of machinery buying by the British government was extremely heavy and at this time Mr. Poultney was assisted by a large staff, including nine inspectors. The tools built for the British government are inspected at the builders' plants, and payments are usually made f. o. b. New York, cash against documents, through the firm of J. P. Morgan & Co. The routine of French government buying is much the same as the British. The French commission has offices at 10 Bridge street, New York City, with M. Auberti in charge of the machine tool section. The only radical difference between the status of the British and French commissions is that the latter is authorized to close transactions itself, whereas British contracts are referred to London for final closing. French payments are also made through J. P. Morgan & Co. Advance payments are not made on tools in the case of either government. Buying by England and France is largely for replacement and filling-out purposes, the major portion of the new construction having been completed some time ago.

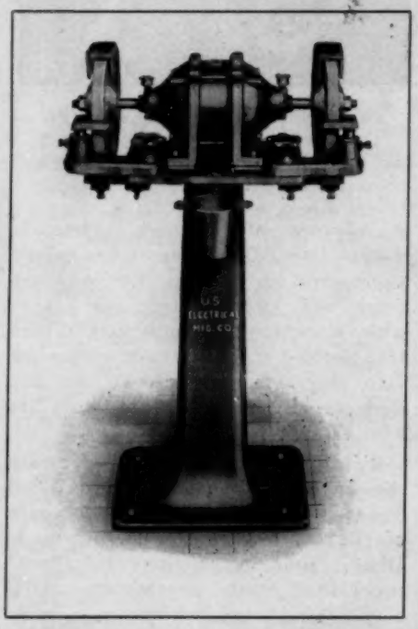
A large amount of buying is done, however, by private manufacturers under the supervision of their respective governments. After the British or French private buyer has satisfied his government that the tools

he requires are essential, he issues his inquiry either to personal representatives of American builders abroad or through authorized agents in the United States. The order is taken by the American builder or seller subject to United States requisitions, changes in import or export regulations, inability to obtain raw material, lack of railroad transportation facilities, acts of an alien enemy and other contingencies arising from current conditions, in addition to the usual clauses against strikes, fires, etc. It is customary for the private buyer to establish credits with local banking institutions and payments usually are made cash against documents, f. o. b. or f. a. s. New York. Sometimes they are made against inland bills of lading, warehouse receipts or ground storage receipts. Occasionally payments are made c.i.f. foreign ports, but owing to the fluctuations of rates of insurance and freight, the general policy is cash against documents on this side. Inspection at the builders' plants, of course, is specified in the contracts and usually is in accordance with the specifications of the American Society of Mechanical Engineers or some other recognized standard.

*Russian Buying Seems Complex*

Buying for Russia is conducted along different lines, although J. P. Morgan & Co. have handled some of this work, also. The buying for the Russian government is concentrated in the Russian supply committee, Fuller building, New York City. This commission is rather complex at first sight but is excellently co-ordinated and the various branches are in close harmony. The departments are as follows: Financial, machine tool, artillery, military technical, military aerial, marine, ways and communications, railroads and railroad shops, ministry of agriculture, All-Russian Zemstov and City Union, transportation, and war industrial department. R. Poliakoff is chief in charge of the machinery department and practically all of the machinery orders placed for the Russian government pass through his hands. The machinery department acts in conjunction with other departments, such as the railroad and railroad shop branch, in the buying of shop tools; with the ordnance department in purchasing ordnance machinery, etc.

The Russian government first places its inquiry in the hands of a Russian and British committee in London, which considers the tools from the standpoint of the possibility of its being filled by English builders. This procedure was instituted before the United States entered the war, when the allies were trying to conserve their gold supply. If the committee passes on the inquiry to the New York commission, the latter receives complete authority to dispose of it. The inquiry may be issued by the machine tool department or by some other department acting in conjunction with the machine tool department. The department of transportation attends to all shipments. The financial department attends to payments for all the departments. Deliveries are specified in the Russian contract to be made by the seller to the buyer free alongside steamer. Payments are made at the offices of J. P. Morgan & Co. within 10 days after presentation by the buyer to the seller of proper invoices and dock receipts showing delivery at the specified steamer dock. Inspection is made at the builders' plants, the buyer having the right to inspect the machines at all times during the manufacture.



SELF-CONTAINED MOTOR-DRIVEN GRINDER

Other allied countries occasionally appear as buyers. Serbian government buying is done through Professor I. M. Puppin, Serbian consul general at New York. A Roumanian commission for a long time had quarters at the Hotel Vanderbilt, New York City, but is no longer active. Belgian buying is done largely abroad through foreign agencies, although sometimes Consul General Pierre Mali, 25 Madison avenue, New York City, issues inquiries. General Tozzi, of the Italian commission, Metropolitan tower, New York, occasionally buys equipment for the Italian government. Japanese government buying is done for the most part in Japan.

## Self-Contained Grinder

A self-contained, motor-driven grinder and buffer has been developed by the United States Electrical Mfg. Co., Los Angeles. The motor is of the totally-enclosed type and the spindle is of one-piece construction. Convenient tool rests are furnished which are adjustable in any direction. Heavy wheel guards are provided to prevent accidents resulting from broken wheels. Both bench and pedestal types are furnished for 1, 2 or 3-phase, 110 to 440-volt alternating current. An option of 1800 or 3600 revolutions per minute and ½ or ¼ horsepower is afforded. A front view of the grinder is shown on this page.

## Engineers Offer Services

The Engineering Council, recently organized, as a department of the United Engineering society to act as a medium for co-operation between the four national engineering societies, held its first meeting at New York June 27. The principal subject discussed was concerned with ways and means by which the founder societies through the council may be of use to the nation. The unanimous desire to help the government in the prosecution of the war resulted in a resolution instructing the executive committee to co-operate with the government in procuring the services of engineers.

The following officers were elected: President, I. N. Hollis; vice president, H. W. Buck and George F. Swain; secretary, Calvert Townley; executive committee, the four officers named and J. P. Channing and D. S. Jacobus. A committee of three, consisting of H. W. Buck, A. M. Greene Jr. and Edmund B. Kirby was appointed to consider the best means of utilizing the inventive ability of members of the founders societies. The present membership of the Engineering Council is as follows:

American Society of Civil Engineers—J. F. Stevens, George F. Swain, F. H. Newell, Alexander C. Humphreys, F. D. Galloway.

American Institute of Mining Engineers—P. N. Moore, S. J. Jennings, B. B. Lawrence, J. Parke Channing, Edwin Ludlow.

American Society of Mechanical Engineers—I. N. Hollis, Charles Whiting Baker, John H. Barr, A. M. Greene Jr., D. S. Jacobus.

American Institute of Electrical Engineers—H. W. Buck, E. W. Rice, N. A. Carle, P. Junkersfeld, C. E. Skinner.

United Engineering Society—Clemens Herschel, B. B. Thayer, I. E. Moltrup, Calvert Townley.

# New Starters for Induction Motors

## The Widely Recognized Convenience of Automatic Starters for Motors Has Served to Stimulate the Development of Alternating-Current Apparatus Embodying Both Simplicity and Ruggedness

BY H. F. STRATTON

THE advantages of automatic starters for induction motors are appreciated almost universally. Until six or seven years ago hand starters were used with the majority of both alternating-current and direct-current motors. Automatic starters for direct-current motors made their appearance about that time, and their numerous advantages were immediately recognized by the users of motors. Unfortunately, the same advance has not been made in the development of automatic starters for alternating-current motors, although there are more squirrel-cage motors in use than any other type of electric motor from the standpoint of numbers and total horsepower. The need of alternating-current, automatic motor starters has been clearly shown by the constant demand for something which would do for the squirrel-cage motor what automatic starters has done for the direct-current motor. This paper describes an automatic starter for squirrel-cage motors developed recently by the Electric Controller & Mfg. Co., Cleveland.

### *Fundamental Principles*

The well-known relation between torque and current in direct-current motors must not be confused with the the very different torque relations of squirrel-cage motors. Within reasonable limits, the torque of a shunt-wound, direct-current motor will increase at the same rate as the armature current, but with compound and series-wound, direct-current motors the torque increases more rapidly than the armature current. If one is in the habit of thinking of direct-current motors he realizes that to increase the torque it is merely necessary to increase the armature current, and this is so whether the motor is at standstill or is running at a high speed or at any intermediate speed. A very different situation exists in the case of the squirrel-cage motor, as the torque may be considered as being determined by the speed of the rotor. The speed-torque curve of the squirrel-cage motor has a peculiar shape; starting at a low value with the rotor at standstill, the torque increases at first gradually and then more rapidly up to its maximum at about three-quarter of synchronous speed and then diminishes rapidly until, theoretically, at synchronism there will be no torque. Fig. 1 shows the speed-torque curve of a squirrel-cage motor having a maximum torque of about 250 per cent of the normal full-load torque and a torque at standstill of about 125 per cent of full-load torque. While the torque varies in this seemingly erratic manner, the current, however, changes in a more rational way. Starting with five or six times full-load current at standstill, it steadily diminishes as the speed increases until theoretically the current is zero at synchronism. There is obviously no simple relation between current and torque in a squirrel-cage motor, and one must put aside the conceptions of the close dependence of torque on current which may have been secured in experience with direct-current motors.

It is common practice to allow 50 per cent overload for the starting current of a direct-current motor; in fact, it is rather necessary not to exceed 50 per cent overload, principally because greater currents are apt to injure the commutator. As the squirrel-cage motor has no commutator, nor in fact, any sliding contacts, it is not necessary to limit the starting current on this account. It probably would not injure the majority of squirrel-cage motors to throw them directly across the line provided the motor started promptly. It would, however, cause such line disturbances due to the excessive current, that it is customary to apply less than line voltage for starting squirrel-cage motors larger than 5 or 7½ horsepower. A transformer having several selective voltages, less than line voltage, is generally used for starting, and after the motor has attained a fair speed, the transformer is disconnected from the motor and line voltage is applied.

### *Limits for Line Currents*

The following table, prepared by the National Electric Light association, shows the values of line current which should not be exceeded in starting a single squirrel-cage motor:

| Size of motor | Line voltage | 2-phase line amperes per phase per H. P. | 3-phase line amperes per phase per H. P. |
|---|---|---|---|
| 5 H. P. to 30 H. P. inclusive | 220 | 8.0 | 9.0 |
| | 440 | 4.0 | 4.5 |
| | 550 | 5.2 | 3.6 |
| | 2200 | 1.0 | 1.0 |
| Above 30 H. P. | 220 | 5.2 | 6.0 |
| | 440 | 2.6 | 3.0 |
| | 550 | 2.1 | 2.4 |
| | 2200 | 0.5 | 0.6 |

Fig. 2 shows the speed-torque and speed-current curves of a squirrel-cage motor, for several different voltages. The objectionable high starting current which is secured by applying line voltage to the motor can be reduced by applying a starting voltage less than line voltage, the motor current at standstill varying almost directly with the applied starting voltage. The objection to reducing the starting voltage is that the starting torque is also reduced, and in fact it is reduced more rapidly than the starting current. The starting torque varies as the square of the starting voltage, so that if half line voltage is applied to a motor at standstill, the motor current would be reduced to one-half, but the torque would be reduced to one-quarter. As neither a high starting current nor a low starting torque is desirable, a com-

### Manufacturers' Standards of Squirrel-Cage Motors

**Voltage Ratings**

Standard voltages shall be 110, 220, 440, 550 and 2200 volts.

**Frequencies**

Standard frequencies shall be 25 and 60 cycles per second.

**Starting Torque**

The starting torque with rated voltage applied shall not be less than the following:

For 2, 4 and 6-pole motors, 150 per cent of full load torque.

For 8, 10 and 12-pole motors, 125 per cent of full load torque.

For 14-pole motors, 100 per cent of full load torque.

**Maximum Torque**

The maximum torque shall not be less than 200 per cent full load torque.

**Allowable Variation from Rated Voltage**

Motors will be guaranteed to operate successfully at normal rated load and frequency at any voltage not more than 10 per cent above or below normal.

The author, H. F. Stratton, is general manager, Electric Controller & Mfg. Co., Cleveland.

promise is reached between the two and a starting voltage is applied to the motor which furnishes sufficient torque to start the load and accelerate it with reasonable promptness. It is customary, however, to guard against the use of a starting voltage which is much higher than needed, and this is done to keep the starting current as low as possible. Three or four different taps are generally brought out from the transformers, so that the particular voltage can be applied at starting, which is best for each application, bearing in mind the desirability of reasonably quick starting and the reduction of the starting current to as small a value as possible. I have mentioned that the starting current in the motor varies directly as the starting voltage, but because of the use of the transformer, the line current varies as the square of the starting voltage applied to the motor. For example, if the motor curent is 400 amperes at standstill with full line voltage, then the motor current

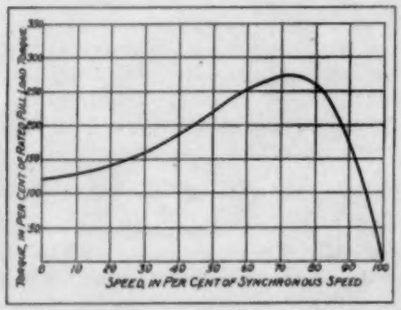



FIG. 1—SPEED-TORQUE CURVE OF INDUCTION MOTOR

will be 200 amperes if transformer taps giving half line voltage are connected to the motor. The line current, however, in this case, would be only 100 amperes.

### *Relation of Torque and Current*

Since both the torque at standstill and the line current vary as the square of the starting voltage, it follows that the torque at standstill varies directly as the line current. This does not mean that the torque of a squirrel-cage motor varies as the current in the line; on the contrary, it merely indicates a relation between torque and current under the following restricted condition. The torque of a squirrel-cage motor at standstill has a certain value upon the application of line voltage, depending largely upon the ohmic resistance of the rotor, and the larger the rotor resistance the larger will be the torque at standstill. Bearing this condition in mind, the relation between standstill torque and line current may be defined by stating that where a transformer is used for starting, the line current varies directly as the standstill torque. However, when the rotor starts to move, the torque immediately increases and the current diminishes.

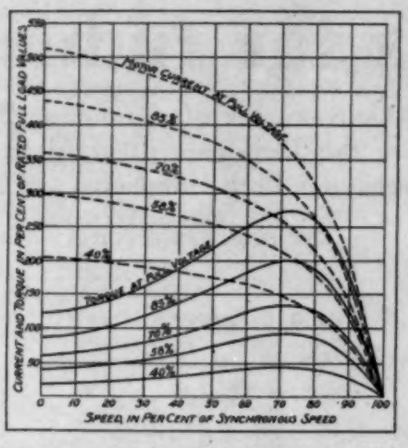



FIG. 2 — RELATION OF SPEED, CURRENT AND VOLTAGES TO TORQUE

The standards applying to squirrel-cage motors which are given in the box on the first page of this article are extracted from the standardization rules of the Electric Power Club, representing practically all manufacturers of alternating-current motors.

Fig. 3 shows the connections usually employed in starting a 3-phase, squirrel-cage motor. *L*1, *L*2 and *L*3 are the line wires; *T*1, *T*2 and *T*3 are the three coils of a 3-phase transformer, each coil having several taps for changing the starting voltage. All the switching contacts marked *S* are closed in starting, and all marked *R* are closed in running. With the starting contacts closed, a reduced voltage is applied to the motor, and when it has attained a certain speed, the starting contacts are opened and the running contacts are quickly closed, disconnecting the transformer from the line and connecting the motor directly to the line. It will be observed that these connections require six starting contacts and three running contacts.

Substantially the same results can be obtained by means of the connections shown in Fig. 4, in which *L*1, *L*2 and *L*3 are the line wires; *T*1 and *T*3 are two coils of an open-delta transformer, each coil having several voltage taps. As before, the contacts marked *S* are for

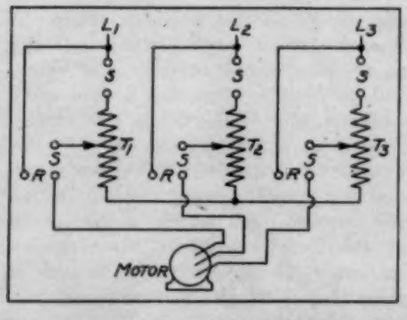



FIG. 3 — USUAL CONNECTIONS EMPLOYED IN STARTING A 3-PHASE SQUIRREL-CAGE MOTOR

starting and those marked *R* are for running. With this method of connection only four starting contacts and two running contacts are required, as against six starting contacts and three running contacts, as shown in Fig. 3.

Speaking generally, the automatic compensator made by the Electric Controller & Mfg. Co. starts a squirrel-cage motor in the usual way, in that the motor initially receives a reduced voltage through a transformer, and after the attainment of considerable speed, the reduced voltage is withdrawn and line voltage is quickly applied to the motor. Beyond this similarity, this compensator differs radically from any existing equipment.

The machine itself is built in one unit, which slips snugly into a case from the top, and which is almost completely submerged in oil, the correct oil level being indicated by letters cast on the frame at the proper elevation. Fig. 5 is a side elevation of the compensator mechanism

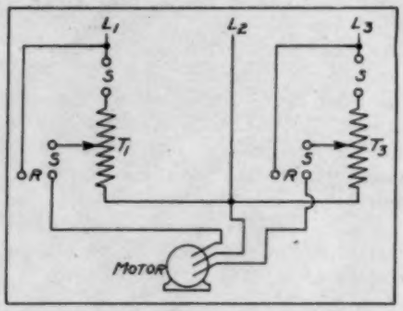



FIG. 4 — FOUR STARTING CONTACTS AND TWO RUNNING CONTACTS ARE EMPLOYED IN THIS METHOD OF CONNECTION

in the "off" position, and Fig. 6 is an elevation of the relay end. In each of these views *T*1 and *T*2 are the two coils of an open-delta transformer. The voltage taps from this transformer are brought up to a terminal board which is above the oil level, the details being shown fairly well in Fig. 6. Any one transformer is built up entirely of laminations of the same shape and size, so designed that they can be assembled with all joints lapped. The assembled transformer laminations are clamped between the transformer end frames, marked *EF*1 and *EF*2 in Figs. 5 and 6.

### *The Magnetic Circuit*

In Fig. 5, *M* is a U-shaped member built up of high-silicon steel laminations which are electrically welded together along six different places on the exterior of the magnetic circuit. Steel plates are also electrically welded to this frame, and are tapped so that, by means of bolts, the magnet may be attached to the main frame of the compensator. There are not any bolts used to hold the laminations together, and there is there-

fore no danger of these laminations becoming loose and noisy after continued use, as the structure is in reality made into one piece by the extensive welding. After the U-shaped magnet has been welded together, its two pole faces are accurately finished, as also are the supporting plates on the back. Three small horizontal slots and one large horizontal slot are cut into the upper pole face. These are shown plainly in Fig. 6. The three small horizontal slots are oil canals to permit the armature to open rapidly when the magnet is de-energized. In the large slot is held a copper bar, each end of which is riveted to a brass casting extending upward and supported by a slanting piece of molded asbestos board. This asbestos board also supports on its under side a cast grid resistance unit. The induced current flows through the copper bar, the two brass castings and the resistance unit when the magnet is in operation, and as this electrical circuit encloses only a portion of the upper pole, there are set up magnetic forces in different sections of the upper pole of the magnet which are out of phase with each other, and which prevent the magnet from chattering.

The operating coil *C* encloses the lower pole of the magnet, and the wire is wound on a brass spool with supporting lugs, the spool being completly cut in two and insulated at the joint, so that it will not have any transformer action.

At the face of the lower pole a strip of non-magnetic metal is loosely supported, forming a gap in the magnetic circuit when the armature is closed. This material is not only non-magnetic, but it also has high ohmic resistance, to reduce the heating and the useless wattage which would be caused by eddy currents. The armature, *A*, is also built up of electrically welded steel laminations, and it is welded to the cast steel armature lever, *AL*, which is pivoted to the frame by means of the phosphor bronze rod, *AP*.

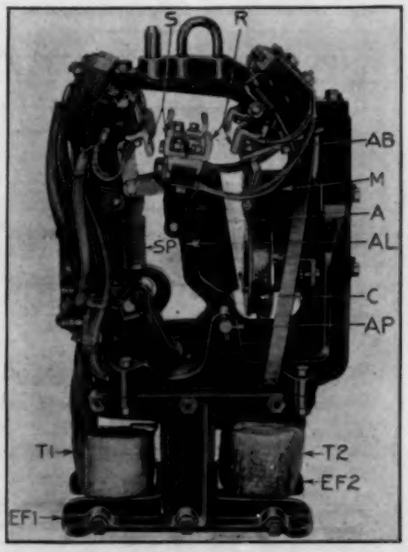



FIG. 5 — SIDE ELEVATION OF COMPENSATOR MECHANISM

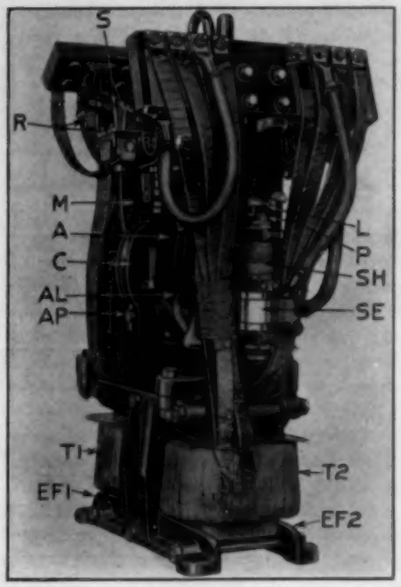



FIG. 6—ELEVATION OF RELAY END OF COMPENSATOR

It will be noticed that there is only one operating magnet for the entire mechanism, and that this one magnet, when energized, must establish the starting connections and, after a delay, allow the starting connections to be broken and the running connections to be established. This is accomplished by a very interesting mechanical movement. With the armature in its closed position the contacts, *S*, are in engagement, establishing the starting connections to the motor. The spring, *SP*, is compressed. The compensator remains in this starting position until it is released by the action of the transition relay. The action of this relay will be explained in more detail later, but for the present it will be sufficient to say that its plunger, *P*, lifts when the starting current in the motor drops to a value which is suitable for a change in motor connections from the transformer to the line. When the trasition relay operates, it raises the pivoted latch lever, *L*, as shown in Fig. 6. This movement of the latch lever permits the compression spring, *SP*, to act on a toggle joint, quickly throwing the movable contacts from the starting side to the running side; in other words, the motor is disconnected from the transformer and is connected to the line, the relative positions of the parts being clearly shown in Fig. 7. When it is desired to stop the motor, with the compensator in either the starting or running position, the operating magnet is de-energized and all parts fall into the "off" position, shown in Fig. 5.

The following is a brief summary of the sequence of operations: First, the operating magnet is excited, closing the armature, compressing a spring and connecting the motor to the source of supply through the transformer; second, after the motor has attained a suitable speed, the transition relay operates a latch, permitting the compression spring to disconnect the motor from the transformer and the transformer from the line and to connect the motor to the line; third, when the operating magnet is de-energized, the armature falls open and the motor is disconnected from the supply lines. The movable contacts do not pass back and forth across the same line, but follow the path shown in Fig. 8. In other words, any point on the movable contacts completely bounds an enclosed area each time the compensator goes through one cycle of operations, passing progressively from "off," to "start," to "run," and finally again to "off."

The transition relay shown in Fig. 6 includes a top shunt coil, *SH*, tending to lift the plunger, *P*, when energized, and a bottom coil, *SE*, in series with the motor in starting, tending to hold the plunger down when energized. Of course, when the shunt coil overpowers the series coil, the plunger is lifted, resulting in the disconnection of the motor from the transformer and the connection of the motor to the supply lines.

If the shunt coil were always excited by the same voltage, it is obvious that the transition would always occur when the motor-starting current had reduced each time to the same value. This would be a satisfactory operation if the starting voltage and therefore the starting current were the same under all conditions, but as a matter of fact, any one set of the three or four sets of

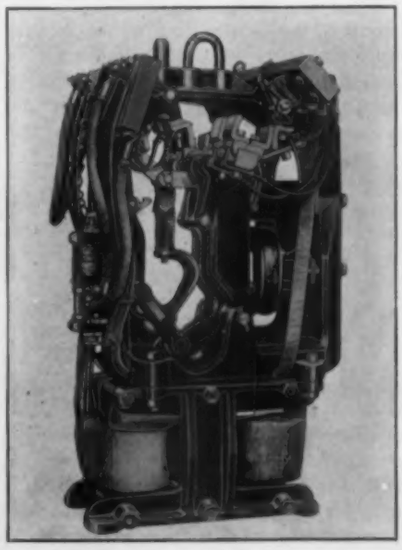


FIG. 7—RELATIVE POSITION OF PARTS WHEN MOTOR IS CONNECTED DIRECTLY TO THE LINE

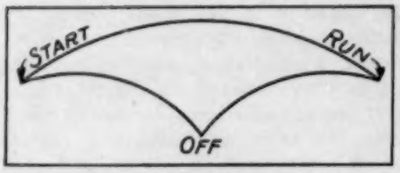



FIG. 8—PATH OF MOVABLE CONTACTS

voltage taps may be used depending upon the load conditions at the start. Referring to Fig. 9, let the lower curve represent the current taken by the motor if connected to the 70-per cent voltage taps, and the upper curve the current taken by the motor if connected directly to the line. Assume the transition is made at the point *c*, such that when the motor is disconnected from the transformer and connected to the line, current will rise to the value *ab*. In Fig. 10, the lower curve represents motor current using the 40-per cent taps and the upper curve the current if the motor is connected to the line. A starting current equal to *de* is sufficient to start the motor, and it would be very undesirable if the current peak at transition would be determined by the operation of the transition relay when the starting current has been reduced to the value of *ac* in Fig. 9. To illustrate this, *fg* in Fig. 10, is drawn equal to *ac* of Fig. 9, which indicates that the current peak at transition would be *fh*, which is considerably more than *ab* of Fig. 9; what is really desirable is that the transition peak with the 40-per cent voltage taps should be less than the transition peak with the 70-per cent voltage taps. This indicates that the transition during operation with the 40-per cent tap, should occur at *k* when the starting current has reached the value *jk*, which is considerably less than the current *ac* of Fig. 9.

This may be summarized by stating that the lower the voltage of the selected taps, the lower should be the value of motor current at which transition is made. For example, if a certain size motor were being started with the 70-per cent voltage taps, then the transition might occur at 100 amperes, but if the 40-per cent voltage tap were being utilized, then the transition should occur at perhaps 60 amperes.

*Transition Relay is Self-Adjusting*

It would not be convenient to change the adjustment of the transition relay each time different voltage taps were selected, because that would necessitate putting ammeters in the circuit, watching the readings very carefully and then varying the adjustment of a relay which is completely submerged in oil. It is very easy to make the selection of different voltage taps, because they are all brought up above the oil level to a terminal board, and flexible connectors are provided which can be moved easily to the terminals giving the desired voltage. Obviously, it would be very desirable if the act of selecting the correct voltage taps might also make the proper change in the adjustment of the relay, so that its operation would be right for the particular taps selected. To effect this, the transition relay is self-adjusting, in that the selection of the voltage taps also selects the right adjustment for the operation of the transition relay. In other words, the higher the voltage tap selected, the higher will be the value of

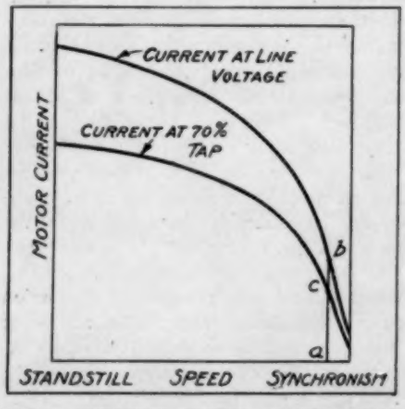



FIG. 9—CURRENT CURVE—70 PER CENT VOLTAGE TAP

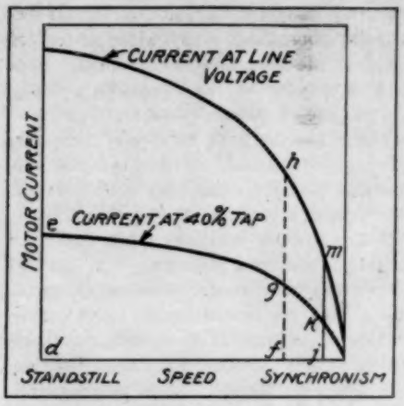



FIG. 10—CURRENT CURVE—40 PER CENT VOLTAGE TAP

motor-starting current at which the relay functions. This beneficial action is obtained by connecting the shunt coil of the relay, not to a source of fixed voltage, but to a source of voltage which is progressively higher as the higher voltage starting taps are selected. In other words, a higher voltage will be applied to the shunt coil of the transition relay using the 85-per cent voltage taps than with the 40-per cent voltage taps. With a relatively high voltage applied to the shunt coil of the transition relay, it is able to overpower the series coil at a relatively high value of motor current. Therefore, we reach the condition of increasing the value of motor current at which transition occurs when the relatively high voltage taps are selected for starting the motor.

Fortunately, both the shunt coil and the series coil of the transition relay can be connected to certain of the main contacts of the compensator whereby they are both excited as long as the compensator remains in the starting position, but are not excited when the compensator is in either the running position or the off position. Consequently, each of these coils is in circuit only a brief time and their connection and disconnection is accomplished without using any small control circuit contacts.

# Puddle Cinder---A Blast Furnace Ore

BY WALLACE G. IMHOFF

WHAT is puddle cinder? Where does it come from? How is it made, and what is its value as a blast furnace ore? Puddle cinder is the slag which is formed in the process of making wrought iron. It comes from the impurities that are removed from the iron. Wrought iron is commercially pure iron, therefore as ordinary pig iron contains varying percentages of silicon, sulphur, phosphorus, manganese and carbon, these have to be removed by the puddling process. Puddle cinder, or the slag formed in the process of making wrought iron, has found a place in the cheaper grades of iron ores which are used in merchant furnaces. The steps of the process are: Making bottom and fixing or fettling the sides; charging the pig iron; melting; adding scale or ore to the bath; making oxidizing conditions; puddling the iron, or agitating the bath by rabbles; balling; drawing, and firing, which is continuous through all other steps.

The pig iron used would have approximately the following analysis:

IRON

| | |
|---|---|
| Sulphur | 0.030 to 0.0260 |
| Phosphorus | 0.50 to 1.35 |
| Silica | 0.60 to 1.40 |

AVERAGE CINDER

| | |
|---|---|
| Sulphur | 0.30 |
| Phosphorus | 1.75 |
| Silica | 20.00 |

Some puddle cinders used as iron

A resume of a paper recently presented before the Cleveland Engineering Society.

ores showed the following analyses:

| | | | |
|---|---|---|---|
| Iron | 55.00 | 54.70 | 54.60 |
| Silica | 18.60 | ..... | ..... |
| Phosphorus | 2.00 | 2.31 | 2.38 |
| Manganese | 1.91 | 2.19 | 1.70 |
| Alumina | .76 | ..... | ..... |
| Lime | 1.20 | ..... | ..... |
| Magnesia | .29 | ..... | ..... |

A charge of some of the larger puddle furnaces would consist of 3,000 to 3,500 pounds pig iron and 300 to 350 pounds scale, depending on the individual heat.

This would give an average weight of about 500 pounds of cinder per ton of puddled iron. By puddling, the carbon, silicon, and phosphorus, are removed by oxidation. The removal of the silicon is accomplished first and is best carried on at low temperatures. The boiling is due to the rapid oxidation of the carbon and the bath drops after the gas evolution has ceased. After desiliconization the cinder is run off and, due to its red color, this step is called "bleeding".

The cinder is added to dephosphorize the iron, and the oxidation of the metalloids is brought about by the addition of the roll scale or iron ore. The dephosphorization is determined largely by the amounts of silicon present in the cinder. Dephosphorization is practically nothing with 25 to 30 per cent of silicon, while when it is as low as 12 per cent, the phosphorus is reduced to 0.06 in the iron regardless of the original amount in the pig.

According to the *Journal of the West Scotland Iron & Steel Institute*, season 1912-1913, Vol. 20, puddle cinder is made up of three parts as follows:

"A solvent ferrous silicate, $2FeO.SiO_2$, which, when pure, melts at 1,183 degrees Cent. Crystallized, it belongs to the rhombic-system like the mineral Fayalite. It contains 70.6 per cent ferrous oxide and 29.4 per cent silica. In its pure form it is too infusible and much too siliceous to form a good cinder.

"The active agent is magnetic oxide of iron, $Fe_3O_4$, or FeO, $Fe_2O_3$, and is dissolved in the ferrous silicate of iron. Therefore, this impure puddle cinder is a very strong solution of oxide of iron. It will dissolve at least half its own weight of oxide of iron. It rapidly oxidizes the carbon, silicon, phosphorus, and even some sulphur. Puddle cinder contains small quantities of lime, alumina, manganous oxide, and other impurities from fettling. Tap cinder solidifies at 1,075 degrees Cent.

"The product of the reaction in the cinder is phosphorus in the form of $Fe_3(PO_4)_2$. This is under 7 per cent in the cinder and tends to increase its fluidity."

The commercial value of puddle cinder as an iron ore is based on the following:

1. It averages fair in iron content.
2. It is high in silica and therefore used to give the slag volume.
3. It is high in phosphorus and is used in making high phosphorus iron.
4. It is an excellent ore as a furnace cleanser for lime.

As seen by the analyses, puddle cinder averages about 50 per cent in iron. Its cheapness gives it value as a merchant ore and when used in a mix with other very dry ores such as roll scale, knobbling cinder, etc., it gives the slag volume. Silica is the volume forming element in any cinder. Its high phosphorus content makes it a desirable ore to be used when making high phosphorus iron, although phosphate rock and phosphate sand are also employed for the same purpose.

This ore is also especially valuable as a furnace cleanser for lime. Cold lime means an extreme shortage of silica, which gives the fluidity to the slag. A large charge of puddle cinder tends to counteract this cold lime by furnishing a large excess of silica. When used as a cleanser for lime, it is put in without lime to flux the silica. The lime in the furnace serves this purpose and is itself removed at the same time, thus avoiding a basic cinder.

# Unknowns of Structural Engineering

BY W. M. WILSON

THE fact that a structure has not failed is not proof that it was properly designed. Structures are generally designed with a factor of safety of about two, based upon the elastic limit. The fact that the structure has not failed is evidence only that all members have a factor of safety of at least one, and there is no evidence to show that some members do not have an excess of material.

For a design to be good it must be well balanced. Although a structure must be safe, it also should be economical. In stating that a structure must be well balanced, I do not mean that the ratio of strength to stress necessarily shall be the same for all members. Many other factors besides strength must be considered. If the failure of a small part will destroy a whole structure, the factor of safety in the small part should be greater than the factor of safety for larger or less critical parts. This is illustrated by the second Quebec bridge disaster. Because of saving in shop costs it is sometimes cheaper to build a member that is too large than it is to build a member that will just carry the load to which it is subjected. Because of the small amount of material involved, it is often cheaper to use an excess of material than it is to make an exact analysis of the stresses. An increase in the live load may cause a much greater increase in the total stress in one member than in other members of the same structure, therefore, if there is a possibilty of an increase in the live load, such a member should have a greater margin of safety in the original design than other members of the structure. Some members upon which a structure as a whole depends, such as the end posts of a truss, are subject to accidental forces, and, although neither the probability of the load occurring nor the magnitude of the stress produced, can be expressed mathematically, these accidental forces should be considered in designing the member. In some structures metal is added above what is required to carry the stress, because the structure is especially liable to corrosion. In such a case all members are not increased by the same relative amount. In some structures rigidity and "feel" of the structure must be considered. This is especially true of railroad bridges, in which it is not only necessary that the bridge figure safe but also it must ride as it is safe. Bearing in mind the factors that have just been enumerated, a design, to be good, must be well balanced. Although it is good engineering to make some members of a structure larger than stress alone requires when there is a definite object to be attained, it is not good engineering to make a member unnecessarily large because of ignorance of its true function.

Good engineering is the best insurance against failure; and wasted material is a tribute to ignorance.

It is not true that the design of a structure is made up only of exact mathematical processes, and that the results are therefore infalible. In general with known forces acting upon a structure the stresses are determined mathematically, and with the total stress in a member known, the area of the section is determined by dividing the stress by the allowable unit stress for the material, after which it remains to select a section having the required area. Thus the structure is designed and apparently only mathematical processes

A resume of a paper recently presented before the Western Society of Engineers. The author, W. M. Wilson, is assistant professor of structural engineering, University of Illinois.

are used. The thing that has been entirely overlooked, however, is the fact that for every mathematical equation used, assumptions have been made in deriving the equation and these assumptions have been entirely neglected in applying the equation. The accuracy of the results depends not only upon the accuracy of the mathematical processes, but also upon the accuracy of the assumptions upon which the mathematical processes are based.

The object in having a more exact knowledge of the behavior of structures is not either to use more material or to use less material, but rather to use the material so that it will do the most good. The structure must be safe, but it should also be economical. The advantages to be gained are economy and safety.

Greater economy in design can be obtained from an increase in knowledge in two ways. If the stress in a member is determined with a high degree of accuracy, what is usually known as a factor of safety is in reality a factor of safety, whereas if the stress is not known, what is termed a factor of safety is largely a factor of ignorance, and the member is made unnecessarily large because of the uncertainty in regard to the stress. If the stress in a member is determined with a high degree of accuracy those types of structures and types of details will be selected for which the secondary stresses are a minimum, and either the safety of the structure will be increased or the cost of the structure will be decreased.

The most important advantage of an increased knowledge relative to the behavior of a structure is the increase in the safety of the design. Shakespeare says that fear springs from ignorance. To the engineer the unknown is the source of danger.

With very few exceptions, failures have been due, not to error in the calculations, but to error in the assumptions upon which the calculations are based. It is the failure of the material to have the properties with which it is credited, or the failure of the structure to resist a stress in the manner assumed, that causes all failures. Design is not solely a mathematical process. Every equation used is based upon assumptions. These assumptions, the foundation upon which our structure of stress analysis is built, need constant inspection.

Structural engineering has made wonderful progress both in design and manufacture. But it is only by keeping before us the importance of the factors that are neglected that progress is to continue. To the man with an inclination for research work, whether engaged in practicing engineering or in university work, structural engineering is a wonderfully attractive field.

## Large Locomotives For South America

Three big electric locomotives, made by the General Electric Co., Schenectady, N. Y., ordered for export to iron mines of South America were recently prepared for their voyage of more than 6000 miles in an unusual manner. Each 120-ton locomotive was taken apart after completion and made up into packages of various sizes and shapes which would allow handling at the loading and unloading wharf by the ship and dock cranes. Each locomotive made 62 separate packages and occupied eight freight cars when ready for shipment. The largest parcel was 45 feet long and weighed approximately 23 tons.

The locomotives were erected in the Erie works of the company, where they were put on test tracks and given thorough tryouts under actual operating conditions. The regenerative braking system received a thorough test with the aid of other electric locomotives in process of building. After the tests were over and the complete testing statistics noted the locomotives were taken apart. The various parts were all marked or ticketed in systematic order so that the locomotives could be reassembled when delivered in South America. On arrival at Cruz Grande, Chili, the locomotives will operate on one of the most unusual ore-carrying railroads in the world. Although the mines are only 4 miles inland the railroad winds in and out a total distance of 15 miles, this roundabout route being necessary in order to limit the grades to 3 per cent. The total ascent the trains must make in order to reach the mines is 2200 feet. It is planned to haul from 12 to 20 50-ton ore cars with one electric locomotive. The ore will be shipped from Cruz Grande to the United States.

## Book Review

*The Founder's Manual*, by David W. Payne, editor of *Steam*; limp leather; 680 pages, 5 x 7 inches; 245 illustrations. Published by the G. Van Nostrand Co., New York, and furnished by THE IRON TRADE REVIEW for $4 net.

Information of interest to foundrymen can be found in a large number of publications devoted to casting problems. Persons in search of this information, however, have not always been able to secure the desired facts without going to an undue amount of trouble in determining the proper source of information. *The Founder's Manual*, by David W. Payne, overcomes this difficulty by combining in one volume a vast amount of material for the solution of problems which are continually presented in the foundry. In the preface, the author states that the proceedings of the American Foundrymen's association have furnished no end of information for the book and he credits Professors Turner, Porter, Reis, Dr. Moldenke, and Messrs. Keep, Longmurr, Augerbridge, West and others for much of the material that has been used. Many articles and tables covered in THE FOUNDRY are reproduced in full in *The Founder's Manual*.

The first three chapters of the book are devoted to elementary mathematics, tables of weights and measures, and natural sines and tangents. In chapter four the weights, dimensions, strengths, etc., of various materials are tabulated. The following chapter is devoted to a brief statement of the principles of mechanics. Chapters IX to XIII contain some unusually valuable information regarding the chemical constituents of cast iron, the theory of mixing irons, and data regarding steel scrap in mixtures of cast iron, the use of test bars in determining the constituents and properties of cast iron, and the value of chemical analyses of iron. Chapter XIV is devoted to standard specifications for cast iron wheels, locomotive cylinders and cast iron pipe. Mechanical analysis is the subject of Chapter XV, and in this chapter is included a description of the shrinkage chart and an explanation of Keep's shrink table. Chapter XVI is devoted to malleable cast iron, and traces the development of the malleable industry since Reaumur's discovery.

The next chapter is devoted to a description and suggestions of the various methods of making steel castings in the foundry. This is followed by a wealth of information on foundry fuels, a description of various types of cupolas; molding sand, including mention of bonding power, permeability and porosity, refractoriness, durability and texture; the core room and its equipment; molding room apparatus; molding machines, including jigs and flasks.

Other chapters are devoted to discussions on continuous melting, the determination of the weights of castings, including methods of finding the weights of patterns, pattern lumber, and formulas for finding the required weight on copes; gas, water, lighting, heating and ventilating. Chapter XXVII covers the subject of foundry cost accounting in a thorough manner. Foundry requisitions, pattern cards, heat book, and various other records are reproduced. A pig iron directory, in Chapter XXVIII, is one of the features of *The Founder's Manual*. In this directory the grades of foundry iron, coke and anthracite and charcoal irons are classified separately. In this directory the trade name of the iron is given and in addition the number of furnaces, the location of the stacks, the name of the operators, type of blasts used and the kinds of ores employed. An alphabetical list of authorities quoted in *The Founder's Manual* and a 13-page index completes the book.

# Heat Treatment of Steel Forgings

## Many Failures of Heavy Steel Forgings Are Directly Traceable to Improper Heat Treating—Failure to Apply Known Facts Rather Than Ignorance is Believed to be the Cause

BY H. H. ASHDOWN

HEAT treatment of steel may cover a very wide field, but the heat treatment of steel forgings suggests at once the impression of handling materials both in quantity and in the mass. To give a broad sense of comparison, one might compare the treatment of a piece of 1-inch round steel with a forging weighing 60 tons, or a furnace full of forgings weighing 200 tons—this being on a parallel with the vastly different conditions ruling when casting ingots weighing a few hundred pounds and those weighing 100 tons.

The author has been closely associated with the investigation, manufacture and treatment of steels in all their phases for the past 25 years, and for the greater part of that period has dealt with them in a commercial sense. It is proposed, therefore, to present the matter of heat treatment in as practical a way as possible, dealing with the subject from a commercial or works standpoint rather than approaching it as a subject of research.

In a measure it is true that the greater percentage of failures occurring is not so much due to the lack of necessary scientific knowledge, but from the want of knowing how to apply that knowledge in works practice, and also in a large measure from the lack of observation generally when forgings are subjected to heat treatment.

An outline sketch of a furnace about 8 x 10 x 100 feet is shown in Fig. 2, containing miscellaneous forgings such as are now comparatively common in big commercial steel works. These furnaces are periodically charged with heavy gun forgings, marine shafting, turbine shafting, and the like, possibly amounting to 150 tons in the aggregate. In the first place thay are heated to a predetermined temperature. Annealing temperatures vary from 650 degrees Cent. to 927 degrees Cent. and the results obtained from the forging naturally vary accordingly. From time to time forgings, machine parts of all descriptions, break down prematurely, due to fatigue. Fatigue temporarily covers a very wide field of inherent troubles. The cause of the so-called fatigue may often be located at the manufacturer's works before such forgings are put into service.

### *Temperature Effects on Steel*

The temperature of 650 degrees Cent. is well under the change point of steels in general, and unless that critical temperature is exceeded comparatively little change is effected in the structural condition. A forging which has been finished at high temperature, or parts which have been raised to a forging heat and have received little or no subsequent work, on cooling retain a very coarse structure. To make this point more clear, the author submits as an example two operations in the forging of a marine shaft, shown in Fig. 1. By withdrawing the already cogged billet *A* from the furnace, the amount of work shown in *B* is performed. Portion $B_1$ is finished, but in order to heat up portion $B_2$ for the subsequent forging operation, a portion of $B_1$ must also be included in the furnace, and this naturally becomes subjected to a prolonged forging heat, subsequently receiving little or no work upon it. The structural condition of this portion of such a shaft may not be unlike that of an unannealed steel casting. A case of this description occurred some time ago. The forging in question was a double intermediate shaft which actually cracked in the lathe during the turning operation. The shaft in question was cut through this defective area, and tests taken in the immediate neighborhood showed conclusively that the trouble experienced was due solely to improper heat treating. This regrettable feature applies not only to large forgings, but equally so to drop stampings.

As an example of a comparatively small forging a special type of heavy bolt was made by heating to forging temperature their full length pieces of round bars and upsetting a portion to form the head as shown in Fig. 3. These forgings were subsequently normalized at 677 degrees Cent. When these bolts were subjected to a shock test it was by no means uncommon for the head to shell off. The reason for this will be readily understood when it is remembered that the only portion which had received any work was the material forming the head. After these forgings received a proper heat treatment a uniformity in structure was obtained, together with the disappearance of any further shelling of the head when subjected to the same shock stresses. A misconception more or less common in heat treatment of steels is that full advantage can be taken of the initial forging heat, and that forgings or stampings finished at a high temperature will, on cooling, regain a fine structural condition. This is entirely wrong, and if it is desired to obtain the best normal structural condition, the heat in such forgings must be allowed first to fall below its recalescence temperature and then reheated somewhat above its calescence temperature and preferably cooled in air. With regard to high-temperature annealing and high-temperature quenching for hardening, it is generally known that as soon as the calescence temperature of the particular steel under observation has been passed, a refining in the structure will result. Practically speaking, the maximum hardness of the steel can be effected by quenching from this temperature. It is also known that after exceeding reasonable limits of this temperature, in

From a paper read before the Institution of Mechanical Engineers, London, March, 1917.

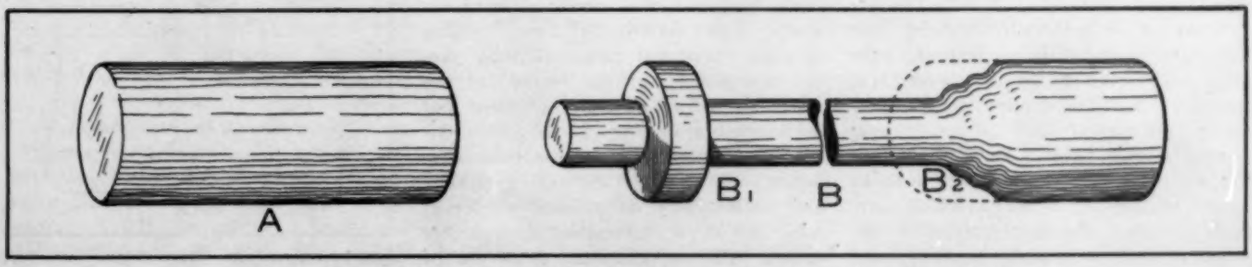



FIG. 1—DIAGRAM OF FORGING OPERATIONS ON A HEAVY MARINE SHAFT

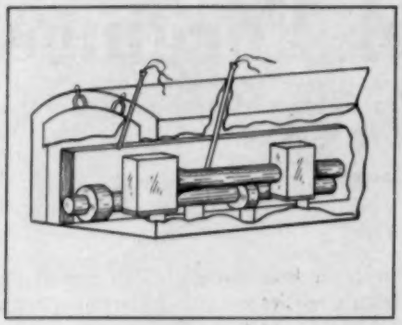


FIG. 2—SKETCH OF FURNACE SHOWING FORGINGS

conjunction with the time factor, the coarse structure redevelops, and develops more rapidly the higher the temperature. A most important point often overlooked is the comparatively long time taken to raise forgings of appreciable size or in quantity to these elevated temperatures.

### *The Use of Pyrometers*

Pyrometers are of great value and service in indicating temperatures, but in inexperienced or careless hands they are more harmful than helpful. For example suppose the pyrometer is in contact with the shaft end of the forging. It is possible to record the desired temperature for many hours, and yet the body of the forging can still be several hundred degrees below that indicated. Comparatively small engine parts, of which, within a length of 3 feet, after heating and quenching, one end has been found to be in its softest possible condition while the other end has been practically unfileable. When it is fully realized that pyrometers simply indicate a local temperature, and that uniformity of temperatures is entirely dependent on careful observation, many of the so-called mysteries, together with their consequent troubles, will disappear.

The Féry radiating pyrometer, Siemens water pyrometer, and Brearley sentinel pyrometer, shown in Fig. 4, each has its own sphere of usefulness. In the latter case, for instance, the sentinels can be placed in positions quite inaccessible to other forms of pyrometers and again can be laid in rotating bodies, their complete fusion denoting their prescribed temperatures.

### *Sand in Annealing*

When it is generally realized that forgings, after their structures have once been refined by a correct heat treatment and are quickly cooled, give better mechanical and physical tests generally, the fallacy of sand annealing will soon disappear. These remarks apply equally so to those which have been quenched and have received a subsequent light annealing or tempering to conform to specified tests. It is sometimes an advantage to bury in sand forgings made from steels akin to those exhibiting air-hardening properties with a view to rendering them soft for machining. If such forgings after machining are to be assembled in the machine in this annealed state, it is then better to cool quickly and reheat slightly below the change-point. If it is intended to anneal forgings in sand with the object of softening for machining, they should be fully covered before they have fallen below the critical temperature, and for comparatively small forgings hot sand should be employed. For the want of a little knowledge on this subject much apparent slackness is practised, and this in a large measure accounts often for many of the so-called hard and soft spots which cause endless trouble and expense in the machine shops. The steelmaker of course usually has all such troubles reflected upon him.

Attention has already been called to the want of uniformity in heating for annealing, and this applies equally to the

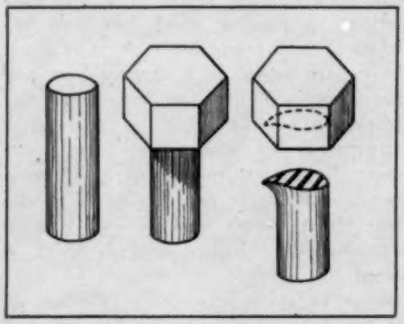


FIG. 3—HEAVY BOLT BROKEN UNDER SHOCK TEST

case of forgings being heated for quenching, in order both to improve their structural condition and also to effect a certain standard of hardness. It might appear somewhat elementary to embrace such remarks as these, but when one finds that such important essentials are commonly overlooked it is well to make it quite clear that all forgings, whatever their size, must be quenched only when uniformly heated above the change-point of the steel. Excessive heating of forgings before quenching is not only productive of a bad structural condition, but also renders the cooling medium unnecessarily hot, and thus effects a comparatively slow cooling of the forging through its critical range, allowing partial precipitation of the ferrite to take place. It will be generally admitted that the quicker a forging can be cooled until the critical range has been passed the better will be its structural condition, and consequently its physical properties will be of a correspondingly higher order. This is a matter deserving of closer attention than it would appear to have received in the past. In recent years marked developments have been seen in the size and weight of gun forgings, until they have assumed ponderous masses and require for their quenching tanks of oil from 8 to 10 feet in diameter and approaching 100 feet in depth. If further developments are to take place the quenching of these colossal masses will have to be seriously considered if we are to obtain the best results.

### *The Cause of Ghosts*

Ghosts in steel forgings are caused by the presence of non-metallic enclosures and whatever form of heat treatment these forgings may subsequently receive, it is practically impossible to remove these ghost-marked areas. It is, however, possible to reduce the size of the ghost-marks, but the treatment necessary is both drastic and costly, and possibly the remedy may prove little better than the evil. This is a subject in which there is yet much room for investigation, and although in some cases their presence need not be looked upon with any degree of alarm, there is no question that a steel free from ghosts is a much superior article. In any case prevention is always better than cure, and it is quite possible for the steel maker to cast ingots of 100 tons in weight with the major portion entirely free from ghosts. The great value of correct and careful heat treatment does not yet appear to be appreciated by many whom it should seriously concern. When it is generally realized that forgings made from the best steel produced can be hopelessly spoiled, due either to insufficient heating or by overheating, and that forgings such as are now under review may be worth many hundreds of dollars, this subject may be given closer attention and considered more as a commercial, scientific art rather than a crude form of craft.

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An extension for five years of its exemption from all classes of taxation has been granted by the Chinese government to the Hangyeh Ping Corporation. The original exemption was granted in 1911, due to damage which the plant had suffered.

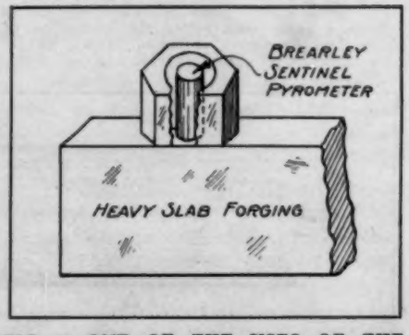


FIG. 4—ONE OF THE USES OF THE BREARLEY PYROMETER

# Submarines Fail to Stop Exports

## Official Figures Show Outbound Shipments of Iron and Steel Products Far in Excess of Corresponding Months in 1916—May Billet and Plate Exports Exceptionally Heavy

WITH one month lacking, it is indicated that exports of pig iron from the United States exceeded 800,000 tons during the fiscal year ending June 30. Foreign shipments of steel billets, ingots and blooms for the fiscal year probably exceeded 1,900,000 tons. These totals are forecast by the report of foreign iron and steel trade for the month of May by the bureau of foreign and domestic commerce, completing 11 months of the fiscal period.

**IRON ORE IMPORTS, GROSS TONS.**

| | May, | | Eleven months ending May, | |
|---|---|---|---|---|
| | 1917 | 1916 | 1917 | 1916 |
| Spain | 16,434 | 26,261 | 216,016 | 89,871 |
| Sweden | 2,237 | 22,306 | 130,595 | 203,845 |
| Canada | 11,740 | 16,292 | 99,611 | 100,635 |
| Cuba | 36,350 | 66,550 | 587,895 | 751,949 |
| Oth. countries | 1 | 17,190 | 60,995 | 145,263 |
| Total | 66,762 | 148,599 | 1,095,112 | 1,291,563 |

May exports of pig iron were 61,112 tons, bringing the total for the 11 months to 751,524 tons. The exports of billets, ingots and blooms were 168,158 tons, increasing the total for the 11 months to 1,745,363 tons. Both the May and the 11-month totals are far in excess of the corresponding periods of 1916.

The total iron and steel exports for May were 588,514 tons, a substantial increase over May, 1916. The outbound

**EXPORTS, GROSS TONS.**

| 1916 | Pig iron | Semi-finished material |
|---|---|---|
| Jan. | 18,719 | 55,315 |
| Feb. | 15,061 | 87,306 |
| Mar. | 19,439 | 107,696 |
| Apr. | 18,518 | 88,764 |
| May | 28,293 | 142,782 |
| June | 48,770 | 116,425 |
| July | 28,718 | 135,827 |
| Aug. | 60,264 | 160,921 |
| Sep. | 64,122 | 163,104 |
| Oct. | 101,756 | 162,679 |
| Nov. | 102,786 | 125,038 |
| Dec. | 105,195 | 162,961 |
| 1917 | | |
| Jan. | 69,146 | 183,656 |
| Feb. | 49,018 | 131,566 |
| Mar. | 69,629 | 193,469 |
| Apr. | 44,783 | 174,039 |
| May | 61,112 | 168,158 |

shipments in May were 69,117 tons greater than in April, but less than during January and March of this year. The 11-month total of iron and steel exports is 6,254,378 tons, compared with 4,328,059 tons for a similar period of 1916. With few exceptions, exports during May showed a fair margin of increase over April. Those in which some reduction is to be noted are scrap, steel bars, barb wire, miscellaneous nails and horse shoes. Foreign deliveries of sheets and plates were exceptionally heavy and amounted to 84,246 tons. This manifestly is a reflection of the heavy shipments of ship steel to various foreign countries. The aggregate value of exports of iron and steel and manufactures thereof in May was $107,362,635, compared with $72,926,180 in May, 1916. The May valuation was approximately five million dollars greater than in April. The total money representation of iron and steel exports for the 11 months ending May, 1917, is $1,010,469,046, against $544,958,836 for the corresponding period ending May, 1916.

Imports of iron and steel during May declined somewhat from the preceding month and were valued at $1,926,609.

**IRON AND STEEL EXPORTS, GROSS TONS**

| | May, | | Eleven months ending May, | |
|---|---|---|---|---|
| | 1917 | 1916 | 1917 | 1916 |
| Scrap | 11,382 | 27,890 | 227,909 | 141,843 |
| Pig iron | 61,112 | 28,293 | 751,524 | 237,958 |
| Steel billets, ing. & bl'ms | 168,158 | 142,782 | 1,745,363 | 845,781 |
| Wire rods | 15,670 | 15,684 | 130,129 | 153,481 |
| Steel rails | 49,260 | 45,840 | 562,336 | 489,037 |
| Steel bars | 62,541 | 77,667 | 697,727 | 564,558 |
| Iron bars | 7,886 | 7,364 | 58,730 | 64,452 |
| Struc. iron & steel | 34,764 | 22,938 | 319,971 | 244,894 |
| Hoops, bands and scroll. | 6,405 | 959 | 42,212 | 37,158 |
| Sh'ts & plates | 84,246 | 45,129 | 595,607 | 448,729 |
| Tin & terne plate | 23,283 | 25,584 | 207,487 | 200,718 |
| Barbed wire | 8,543 | 39,295 | 285,829 | 326,737 |
| All oth. wire | 19,734 | 22,957 | 220,307 | 221,474 |
| Cut nails | 368 | 614 | 4,252 | 4,053 |
| Wire nails | 10,133 | 12,204 | 114,855 | 111,509 |
| All oth. nails incl. tacks. | 1,744 | 745 | 16,960 | 8,567 |
| Pipes & fit'gs | 18,867 | 17,009 | 221,804 | 160,194 |
| R. R. spikes | 1,332 | 1,960 | 16,833 | 24,304 |
| Bolts, nuts, rivets and washers | 2,204 | 2,494 | 26,732 | 28,686 |
| Horseshoes | 320 | 1,051 | 4,024 | 11,756 |
| Cast radiators | 562 | 198 | 3,787 | 2,170 |
| Total | 588,514 | 538,657 | 6,254,378 | 4,328,059 |

Scrap receipts which were unusually heavy in April, when 34,841 tons were brought in, dropped to 16,372 tons in May. Pig iron imports also declined from 8771 tons in April to 4322 tons in May. Those of steel ingots, blooms and billets were slightly less in May. The total imports for the fiscal year ending with June will be sharply reduced, as compared with the corresponding period of 1916. The 11-month's imports of iron and steel show 365,512 tons, compared with 647,678 tons during the 11 months ending May, 1916.

A slight increase in iron ore imports was shown by May, when 66,762 tons were received, compared with 58,878 tons in April. The May figures, however, were much less than those for May, 1916, when the shipments were 148,599 tons. The total ore imports for the 11 months ending May, 1917, were 1,095,112 tons, compared with 1,291,563 tons for the corresponding period of the previous year. Cuba has continued to supply over half the total importations. For the past 11 months, it has furnished 587,895 tons. In 1916, during a similar length of time, 751,949 tons were shipped from that

**IRON AND STEEL IMPORTS, GROSS TONS**

| | May, | | Eleven months ending May, | |
|---|---|---|---|---|
| | 1917 | 1916 | 1917 | 1916 |
| Scrap | 16,372 | 6,407 | 208,236 | 92,144 |
| Pig iron | 4,322 | 10,067 | 111,767 | 104,291 |
| Steel ingots, bl'ms and billets | 3,616 | 4,842 | 23,046 | 21,748 |
| Wire rods | 1 | 434 | 2,064 | 4,126 |
| Rails | 1,491 | 9,196 | 13,097 | 49,233 |
| Bar iron | 33 | 909 | 4,241 | 6,990 |
| Structural | 133 | 67 | 926 | 1,305 |
| Sheets and plates | 44 | 152 | 1,526 | 1,618 |
| Tin & terne plate | 1 | 39 | 609 | 711 |
| Total | 26,013 | 32,113 | 365,512 | 647,678 |

country to the blast furnaces of the United States. Of the transatlantic sources of supply, Spain has made the best showing with 216,016 tons for the 11 months. This represents a very large increase over the corresponding period

**IMPORTS AND EXPORTS, GROSS TONS.**

| 1915 | Imports | Exports |
|---|---|---|
| July | 20,858 | 380,340 |
| August | 27,556 | 405,850 |
| September | 23,345 | 382,113 |
| October | 34,318 | 349,843 |
| November | 37,131 | 362,764 |
| December | 35,408 | 353,853 |
| 1916 | | |
| January | 15,824 | 360,102 |
| February | 20,279 | 368,980 |
| March | 15,159 | 438,649 |
| April | 20,176 | 384,452 |
| May | 32,114 | 540,580 |
| June | 26,786 | 526,759 |
| July | 14,729 | 503,187 |
| August | 32,257 | 597,739 |
| September | 25,559 | 643,762 |
| October | 30,169 | 610,110 |
| November | 42,545 | 554,856 |
| December | 44,134 | 580,957 |
| 1917 | | |
| January | 40,192 | 608,105 |
| February | 24,379 | 449,099 |
| March | 37,280 | 606,559 |
| April | 48,213 | 519,397 |
| May | 26,013 | 588,514 |

of the preceding year, when only 89,871 tons were received.

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McCrossin & Darrah, American Trust building, Birmingham, Ala., have been named Alabama representative of the Link-Belt Co., Chicago, with a personnel including E. Francis McCrossin and John F. Darrah, both experienced in Link-Belt engineering work. Practically the entire Link-Belt line, including malleable iron and steel Link-Belt, sprocket wheels, chain drives, elevating and conveying machinery, locomotive cranes, etc., will be handled.

# Shaping Plans for Price Control

## Food Bill Now Approaching Passage Gives President Wide Powers Over Iron and Steel and Other Industries—Central Agency Proposed for Regulating Steel Prices and Distribution—Hope to Avoid Drastic Action

Bureau of THE IRON TRADE REVIEW,
708 Metropolitan Bank Bldg.,

WASHINGTON, July 10.—Government regulation of prices of a wide variety of products, including steel and its products, copper, lead, aluminum, coal, farm implements, etc., is an active possibility. Passage of the food control bill is about to be brought about by the senate and inasmuch as it has included the products named, together with others, in its provisions, it will clothe the President with sweeping powers as to controlling prices. There is no doubt that he will take advantage of the authority conferred upon him unless voluntary agreements are made between the government and producers as to prices he considers satisfactory. While there is a difference of opinion among senators as to whether the measure actually gives the President authority to fix prices or to regulate them, it is, at the most, only a technical point, for one virtually is the same as the other. In any event, the bill does indirectly, give the President the right to fix prices. It is so broad and comprehensive in its scope, that it gives the President the widest possible powers as to controlling almost the entire industries of the nation.

### *No Drastic Action Expected*

The measure, essentially prompted by the exigencies of war, names the products previously set forth as being "necessaries." An amendment offered by Senator Kenyon, a member of the agricultural committee, which has been adopted, brings them under that definition. Senator Kenyon told THE IRON TRADE REVIEW that the bill does not authorize the fixing of prices of anything except food and fuels, and this view has been concurred in by Senator Chamberlain, in charge of the bill. But both conceded that, if prices named by the President as being reasonable, are not acceptable to the producer, he can requisition and take over any plant. The producer in such a case would be paid 75 per cent of the amount determined by the President and be entitled to sue the government to recover such further sum as, added to the 75 per cent, will "make up such amount as will be just compensation therefor, in the manner provided for by section 24, paragraph 20, and section 145 of the judicial code." Moreover, the President can, through this process or through voluntary agreement with producers, regulate the prices at which steel may be purchased by the general public. The prices to be paid by this government no doubt will be made applicable to purchases for its allies.

Actual regulation of prices, it is believed, will be brought about when the federal trade commission makes its report to the President as to the cost of producing steel. This report, it is understood, will be ready within a few weeks. The process of distributing steel and regulating prices for it, it is believed, will be performed by a central purchasing agency, which may be connected with the council of national defense. Creation of an agency if this kind is provided for in the socalled food control bill. The President, it is said, does not propose to resort to drastic measures in the way of regulating or fixing prices or commandeering plants, and will do so only as a last resort. Apprehension is felt, however, that the President's attitude toward the prices of steel is more or less in accord with the radical views for sharp reductions held by such men as Chairman William Denman of the United States shipping board and Secretary of the Navy Josephus Daniels.

This agency would be designed partly to "avoid any preventable loss or duplication of efforts or funds." One of the first things that will be done probably is to bring about a reduction of prices of coal and coke. With these raw materials leveled in prices, it is pointed out the steel manufacturers will be in a position to have prices for their products regulated. Appeals have been made to members of congress by steel makers that prices of their products be regulated, but it is urged that the first thing necessary is to bring down the prices of coal and coke. Extremely vigorous attacks have been made by many senators, particularly Senator Pomerene of Ohio, on coal operators because of the high prices at which their product is selling. Allowing for the high cost of labor, and equipment they use, it is insisted that the figures demanded by coal and coke producers are not warranted, and the main fear is that, instead of regulating them along reasonable lines, radical steps may be taken to reduce them to levels that would injure not only these, but industries of all kinds. In the matter of prices for coal, it is stated that the President feels the average figure should be not more than $2 a ton at the mines. The effect of the high prices for coal and coke, it is pointed out, is reflected in the cost of producing pig iron. In northern furnaces, it is asserted, it will soon cost $30 a ton to make iron, if prices of coal and coke continue to soar. The $20 mark passed long ago, it has been shown, and the average cost per ton for June has been estimated at about $24. Furthermore, complaint has been made that some coke producers are not delivering on contract, but are selling at spot market quotations, with the result that up to $16 is being paid today for the identical coke that had been contracted for at $8, or less.

In connection with the plan to regulate prices, it is asserted by certain senators who are considered to be representing the administration's view, that it is not its purpose to be arbitrary or unfair and that if prices can be brought to a satisfactory level no drastic steps of any kind disturbing to business will be taken. Necessarily, there may well be a wide difference of view as to what constitutes reasonable profits, which the government authorities say they are willing to pay. There is no question that many business men feel that the government is attempting to reduce prices to an imposible minimum.

### *The President's Licensing Powers*

The bill, among its sweeping provisions, makes it unlawful for any person willfully to destroy any "necessaries" for the purposes of enhancing the prices or restricting the supply thereof, and it also makes it unlawful to hoard such necessaries. Violation of the provision would be punishable by a fine not exceeding $10,000, or by imprisonment not exceeding two years. From time to time, whenever the President shall find it essential to license to the importation, exportation, manufacture, storage, mining, or distribution of any "necessaries," and shall by proclamation so announce, no person shall, after a date fixed in the proclamation, engage in or carry on any such business specified therein, unless he shall secure and hold a license. It is also provided that the President shall prescribe such rules and regulations governing the conduct of the business of licenses as may be necessary. Any person who, conducts a specified business without a license or is guilty of any unjust practice is liable to a fine not exceeding $5000 or by imprisonment for

not more than two years or both. This section does not apply to any farmer, gardener, co-operative association of farmers or gardeners, including live stock farmers, or other persons with respect to the products of any farm, garden, or other land owned, leased, or cultivated by him, nor to any retailer with respect to the retail business actually conducted by him, nor to any common carrier, etc.

After thus exempting the farmer and gardener, the bill, which permits the President to issue regulations as to the employment, control and compensation of employes, carries a provision for the benefit of wage earners. It recites that whenever "any person or persons entitled to receive such wages are dissatisfied with the rate of wages so fixed by the President, he or they shall have the right to have the reasonableness of such wages reviewed and determined by the board of mediation and conciliation; and in case said board shall conclude that a higher rate of wages shall be allowed their finding shall prescribe rules and regulations for carrying this proviso into effect." It is further provided that all moneys received by the United States from or in connection with the use or operation of "any such factory, mine or plant, or part thereof, may, in the discretion of the President, be used as a revolving fund for the purpose of the continued use or operation of any such factory and the accounts shall be kept separate and distinct."

Senator Kellogg of Minnesota, said that the government may fix the purchase under the bill, but that if, as he hopes, there is an open market left and the price is reasonable, "you will not find the government purchasing." His allusion was to the authority given the President to making, purchasing and reselling products to the general public at "reasonable prices," which has been the subject of more or less discussion of late.

# Federal Ship Program Will Be Doubled

WASHINGTON, July 10.—Estimates are being prepared by the United States shipping board for an appropriation by congress of $500,000,000 to be spent in building merchant ships to defeat the submarine. Only recently a similar sum was allowed by congress. The sum proposed to be spent by the shipping board within the next 18 months for merchant ships is therefore $1,000,000,000, with which it is hoped to create 6,000,000 tons of ships, through contract, the taking over of ships under construction, and those already built. Virtually 1,000,000 tons is assured through the taking over of ships being built in American yards for Great Britain at a cost of $110,000,000.

Nothing official has been given out as to the type of the additional ships. It is probable, however, that the program will be partly similar to the present one, which calls for the building of both steel and wooden ships. In any event, the further demands to be made upon the steel plants and ship yards will be extremely heavy. Reports lacking verification have it that the new ships may be cargo carriers of from 10,000 to 12,000 tons and that some of them may be constructed of reinforced concrete.

*First Appropriation Not Yet Spent*

While the first appropriation of $500,000,000 has been made by congress for the shipping board and has been parceled out, it has not been spent. But plans of the board would mean that all of it would be gone before July 1 of next year. If work is to be carried on continuously, it is pointed out, congress must grant another appropriation of half a billion dollars to execute the program that the board now is able to map out for itself beginning with the fiscal year of 1918. Major Gen. George W. Goethals, general manager of the Emergency Fleet Corporation, has prepared himself to contract for between 300 and 400 ships of about 2,100,000 tons dead weight carrying capacity. The fact that the price to be paid for steel has not been determined will not delay the program, unless President Wilson himself defers a decision as to what the price of steel shall be. It is claimed the President is about ready to make that decision, waiting upon the report to be made on this question by the federal trade commission.

*Plan International Ship Control*

In connection with the plans of the board to increase its building program it has been learned that a move to formulate an international control of ships, centered in Washington, is under way. Among those called in to take up this matter with the board is Sir Thomas E. Royden, commissioner representing the British control of ships, who is in Washington. It is tentatively proposed to have an inter-departmental committee formed to consult with the shipping board in order that the ships owned or controlled by the government may be operated at the maximum of efficiency. At present each government department owning ships uses them without regard to what they might do for some other branch.

It is known that members of the shipping board regard with favor a suggestion that there should be co-ordination of the water transportation facilities. There is some misgiving however, as to the bringing about of such centralized control with the United States government in the dominating position. On the other hand the fact that this country is having so large a share in financing the war has been urged as a sound reason as to why it should assume such position.

## Munitions Board Reports Its Accomplishments

Washington, July 10.—Activities and accomplishments of the general munitions board of the council of national defense and its subcommittees have been set forth in a statement given out by Frank A. Scott, chairman of the board. The board has developed sources of supplies for rifles and other small arms, machine guns, ordnance of many types, ammunition, gun forgings, carriages, limbers, caissons, forge wagons, military vehicles, steel helmets, armor piercing shells, surgical supplies, optical glass, gages, tools and dies of many kinds. The board likewise has served in an advisory capacity for the government in the building of cantonments, the determination of prices, the establishment of storage facilities, and the settlement, in a limited degree, of the priority in shipment of war munitions.

The board is composed of navy officers, with a civilian chairman, and is charged with the duty of co-ordinating the requirements of the two military arms of the government and of assisting in developing new sources of supply of war materials. The board has acting under it special subcommittees of civilians and army and navy officers.

In outlining the work of the board, Chairman Scott said:

"It is not possible to say after three months' work that the problem is solved. No such problem can be solved; it is a continuous task which will involve constant effort and study to further expand our munition making facilities as the war progresses. It can be stated without unduly con-

gratulating ourselves on what has been accomplished, however, and without forgetting how much remains to be done, that we can see light ahead in many directions. The small arm supply offered comparatively little difficulty, since it was possible for our ordnance department to adapt to American use the output of firms manufacturing the British Enfield rifle by having that arm manufactured to use American ammunition.

"To obtain an adequate artillery supply was a graver question, as comparatively few American firms have been engaged in manufacturing artillery for the allies, and we therefore lacked that advantage. Substantial progress has been made, however, and it has been greatly facilitated by the work of the committee on army and navy artillery of the board, which has developed an unexpectedly large manufacturing capacity for gun forgings and gun machining."

## Pittsburgh-Chicago Steel Rate is Advanced

Washington, July 10.—In its final report in the central freight association class rate scale case, handed down July 7, the interstate commerce commission condemned the scale prepared by the railroads, and required them to cancel the tariffs carrying it. It is said, however, that they might substitute therefor a scale reported tentatively by Examiner Disc in May. The scale, which will be made effective as soon as the carriers can check in tariffs, will add between $4,000,000 and $5,000,000 to their revenues, on the 1916 tonnage basis. This has no connection with the 15 per cent case decided by the commission June 30. The advances allowed therein will be superimposed upon the scale approved by the commission in the instant case. This new scale, together with the 15 per cent decision, and the 5 per cent decision of December, 1914, will give carriers between Toronto, Buffalo and Pittsburgh on the east and Milwaukee, Chicago and St. Louis on the west an aggregate advance of fully 25 per cent.

The scale means an actual reduction in the rate on blooms, billets, etc., from Pittsburgh to Chicago. The present rate is 15.8c. The carriers proposed 16c, and the commission allowed 15c. The present Pittsburgh-Chicago fifth class or general finished steel rate is 18.9c. The carrier proposed a rate of 19c, and it was allowed. Reductions and increases in these rates were made proportionately throughout the whole territory effected by the changes of rate.

# Prevailing Rates

### In Bar Iron Wage Scales are Continued After Joint Conference

Wage scales now in effect in bar iron mills working under an agreement with the Amalgamated Association of Iron, Steel and Tin Workers will continue in the year ending July 1 next. Manufacturers and officials of the Amalgamated association voted to continue prevailing wage rates at the recent conference at Atlantic City, which ended June 30. The boiling rate is based upon $5.50 per ton of 2240 pounds on a 1c bar iron card. It provides an increase of 10 cents a ton for each advance of 5 cents over the base rate, up to and including the 1.25c card. For the next succeeding advances of 5 cents above base, an advance of 20 cents a ton for boiling is provided, up to and including the 1.95c card, after which an advance of 25 cents a ton is allowed in the boiling rate for each advance of 5 cents above base.

The wage committee of the Amalgamated association recommended the adoption of a boiling rate based upon $6 a ton for boiling on a 1c card and providing irregular advances ranging from 5 cents to 50 cents a ton, up to and including the 1.40c card; no changes were proposed in rates after the 1.40c card was reached. Several changes of minor importance affecting working conditions have been made in the footnotes to the bar iron mill cards.

## Probe Boycott Trouble

Aug. 1 has been fixed as the date when the Seattle Metal Trades Council will put into effect a boycott on the use by union laborers of the products of the Washington Iron Works. Notice of the proposed boycott has been sent to 750 labor councils. The difficulty is so serious between the iron works and the union workmen that the federal government has sent H. M. White, immigration commissioner, who is under the jurisdiction of the department of labor, to investigate and report on the affair. Union metal workers at the iron works went on a strike some time ago to enforce their demands for higher wages, shorter hours and "closed shop".

## Forced Out by Labor

The Rhode Island Perkins Horse Shoe Co., Valley Falls, R. I., a $2,750,000 corporation organized in 1867, is going out of business on account of labor conditions. Charles R. Stark, secretary and treasurer, said that it has been impossible to operate the mill with profit since July 1, 1916, at which time the employes were locked out. He also said that the sympathy of the community appeared to be largely with the men, who insisted on the signing of an agreement which would have had the effect of placing the union in virtual control of the property.

## Labor Disputes Show Decreasing Trend

A decreasing number of strikes in industrial plants is attracting favorable attention. Some recent developments in labor disturbances include: Strike of puddlers at the Girard Iron Co., Girard, O., over lack of recognition of the newly organized branch of the Amalgamated Association of Iron, Steel and Tin Workers, settled recently; about 300 employes of the Pusey & Jones Co., Wilmington, Del., on strike recently now have returned to work; a strike of 250 employes of the Champion Machine & Forging Co., Cleveland, settled through the efforts of federal conciliators, and a strike of 7000 employes at the Schenectady plant of the General Electric Co., due to the employment of a negro in the shops; strike of machinists of Bridgeport, Conn., for a 15 per cent increase and universal working schedule; resumption of work by employes of the Eagle Lock Co., Terryville, Conn., with a 10 per cent increase; a strike of workmen at the Atwood Machine Co., Stonington, Conn., for an 8-hour day; resumption of about 100 employes of the O. & J. Machine Co., Worcester, Mass.; strike for 100 per cent increase by about 150 snaggers in the foundry of the Saco-Lowell shops, Newton Upper Falls, Mass.; strike of employes of the International Nickel Co., Bayonne, N. J., numbering 1900, owing to refusal of a 15 per cent increase; strike for 15 per cent increase by workmen at the plant of the American & British Mfg. Co., Bridgeport, Conn., and strike of workers of the Hazard Wire Rope Works, Wilkes Barre, Pa.

## Labor Notes

The fan motor department of the Pittsfield, Mass., plant of the General Electric Co., is to be removed to Watsessing, N. J., where labor conditions are considered better. The department is operating day and night.

The shops of the Snell Auger & Bit Mfg. Co., Fiskdale, Mass., were shut down from June 30 to July 9, to allow the employes to aid the farmers in the surrounding towns who are threatened with a heavy loss to their crops because of inability to procure farm help.

# Growing Supplies

**Of Domestic Manganese Are Shown—80,000 Tons High Grade Predicted**

Washington, July 10.—Attention is called by Secretary of the Interior Lane to the encouraging increase in the production of manganese ore in this country. "Modern steelmaking demands manganese," said Secretary Lane, "and the shortage of a domestic supply of this ore has been a matter of concern to those of us who wish America to be industrially independent. But now the war requirements for steel have been realized by the manganese operators, for reports already received in the department of the interior show that shipments of high grade manganese during the past six months aggregate 28,345 tons or nearly 10 per cent more than the tonnage for the whole 12 months of 1916, which amount in turn was three times the 1915 shipments. Shipments are reported from 10 states, but in Montana alone the shipments since last January largely exceed the shipments for the whole United States in 1915.

"The manganese situation therefore is most encouraging and the United States geological survey estimate for the whole year is 80,000 tons of the high grade ore. This, however, is less than 20 per cent of the present large demand of the steel industry. Yet, it is significant that the shipments of lower grade manganese ore likewise are record breaking, the six months of 1917 considerably exceeding the 12 months of 1916, and the present rate of production promises an even larger tonnage for the remaining six months. This gratifying activity in the mining of so essential an ore seems to be largely the result of better financing and better engineering of the industry, which in turn is simply another expression of how America is meeting the present crisis in American fashion."

## Mining Engineers to Meet

Preliminary plans for the fall meeting of the American Institute of Mining Engineers, which will be held at St. Louis, Oct. 8 to 13, have been completed. There will be three technical sessions, on Monday, Tuesday and Thursday, respectively, at St. Louis, and also technical sessions on Friday and Saturday, at Joplin, Mo., and Tulsa, Okla. On Monday afternoon, Oct. 8, there will be a boat ride to Herculaneum, Mo. Dinner will be served on the boat. The usual fall banquet will be held Tuesday evening, Oct. 9. Wednesday, Oct. 10, will be given over to a special trip to the southeastern Missouri lead district. On Friday and Saturday, special trains will be run to the Joplin-Miami mining regions and to the Tulsa oil fields. H. A. Buehler, state geologist, Rolla, Mo., is chairman, and W. E. McCourt, geologist, Washington university, St. Louis, secretary of the local committee on arrangements.

# Plant Extension

**Of Dominion Steel Corporation Well Advanced—Enlarge Nickel Plans**

Toronto, July 10. — President Mark Workman and Vice President William McMaster, of the Dominion Steel Corp., have returned from a two-weeks inspection trip to the company's properties. All departments are operating to capacity and work on extensive improvements is making good progress. The first battery of 60 coke ovens now being installed will be ready for operation next winter, and a second battery of the same size about a year from date. The new blast furnace will be ready for operation in two or three months. The output for June was as follows in tons: Pig iron, 29,375; steel ingots, 30,647; blooms, 15,980; shell blooms, 11,485; shell bars, 4868; rods, 10,400; nails, 3534.

E. P. Matthewson, general manager of the British American Nickel Co., which has acquired the Murray mine and other nickel properties in the Sudbury district, states that construction of the new smelter and refinery some 4½ miles northwest of Sudbury, has been started. Some 200 men are at work. The original plans were prepared for a plant to cost about $7,000,000. Development and exploration work at the mine however have resulted in large and important discoveries of ore which have induced the management to considerably enlarge the original plans. The investigation has shown that the Murray mine has 3,000,000 tons of ore and the other properties 5,000,000 tons. Diamond drilling has resulted in further discoveries at the 950 foot level, which in the opinion of the engineers indicate the existence of an additional 5,000,000 tons of ore. The refining will be done by the Hybinette process hitherto used exclusively in Norway, the Canadian and American rights for which have been purchased by the company.

The Canadian Aloxite Co., a subsidiary of the Carborundum Co. of Niagara Falls, N. Y., has begun the construction of a large plant at Shawinigan Falls, N. Y., for the manufacture of carborundum and other abrasives. It will be completed about the end of the year and give employment to some 300 men. The company has just closed a contract with the Shawinigan Water & Power Co. for a supply of 20,000 horsepower.

# Government Buying

**Adds to Delayed Deliveries in Refractories—Prices on Rise**

Pittsburgh, July 10.—The general situation for refractories has been disturbed slightly by the giving of preferential shipments to consumers working on government contracts. Makers of firebrick and refractory material are co-operating with the national defense council effectively. Despite the fact that shipments generally are deferred from three to five months, industries furnishing steel for the manufacture of munitions are not being embarrassed by inability to obtain fire clay products. In some districts, notably in northern Ohio, car shortages are the makers' chief problem in making deliveries. One manufacturer obtained less than 10 per cent normal supply in 10 days, and on some days not a car was received.

Several manufacturers have made no changes in minimum prices since May 1, when first quality Pennsylvania fire clay brick was advanced $5 to $45 a thousand. Many sellers, however, are refusing to shade $50 and reports of sales at as high as $60 are heard. First quality Ohio brick has commanded $50. No change is noted in the situation for silica brick in the Pennsylvania, Chicago and Birmingham districts. Several manufacturers of magnesia brick are selling at as high as $160 a net ton, but the $135 price has not been withdrawn by all makers. An early advance, however, appears to be imminent. A scarcity of chrome brick generally exists.

## Refractories

(Per 1000 f. o. b. works.)

**FIRE CLAY BRICK.**
(First Quality.)

| | |
|---|---|
| Missouri-Illinois | $45.00 to 55.00 |
| Pennsylvania | 45.00 to 55.00 |
| Ohio | 45.00 to 50.00 |
| Kentucky | 45.00 to 55.00 |
| New England | 55.00 to 65.00 |

**FIRE CLAY BRICK.**
(Second Quality.)

| | |
|---|---|
| Pennsylvania | $40.00 to 50.00 |
| Ohio | 37.00 to 40.00 |
| New England | 48.00 to 58.00 |

**SILICA BRICK.**

| | |
|---|---|
| Pennsylvania | $50.00 to 60.00 |
| Chicago | 55.50 to 65.50 |
| Birmingham | 45.00 to 55.00 |

**MAGNESIA BRICK.**
(Per Net Ton.)

| | |
|---|---|
| 9 x 4½ x 2½ | $135.00 to 160.00 |

**CHROME BRICK.**
(Per Net Ton.)

| | |
|---|---|
| 9 x 4½ x 2½ | $125.00 to 135.00 |

**BAUXITE BRICK.**
(Per Net Ton.)

| | |
|---|---|
| 55 per cent. | $40.00 base |
| 76 per cent. | 100.00 base |

# Men of the Iron Trade

**Personal News of a Business Character Regarding the Men of Affairs of the Industry**

WILLIAM K. KENLY has taken a position as assistant to George F. Davie, vice president and treasurer of the Interstate Iron & Steel Co., First National Bank building, Chicago, Mr. Kenly resigned recently as president, treasurer and director of the Merchants Steel & Supply Co., 1810 Continental & Commercial National Bank building. He has disposed of his stock in that company to E. John Hicks, vice president, and T. A. Schwangel, secretary. Mr. Kenly formerly was president of the National Scrap Iron and Steel association.

R. E. Wells has been appointed engineer of the motor car division of the Hyatt Roller Bearing Co., Detroit.

E. N. Hurley, formerly president of the Illinois Manufacturers' association, has been chosen a director of the Chicago Great Western railroad.

C. von Phillip, head of the mechanical department of the Bethlehem Steel Co., had a stroke of apoplexy July 3 while at Ocean City, N. J., and is reported to be in a dangerous condition.

Charles L. Allen, treasurer and general manager of the Norton Co., Worcester, Mass., has been appointed a member of the parks and recreation commission of that city.

K. G. Martin, publicity manager of the American Steel Export Co., Woolworth building, New York, has left for El Paso, Texas, to assume his duties as captain of the motor truck company No. 157, United States army.

F. T. Coup, formerly connected with the Chicago office of the Wagner Electric Mfg. Co., St. Louis, has been made manager of the new office just opened in the First National Bank building, Milwaukee.

John E. Perry has been chosen president of the executive committee of the Wharton Steel Co., Wharton, N. J. Other members of the committee are: J. Leonard Replogle, chairman; I. Townsend Burder and L. E. Warind.

Harry O. Anderson, one of the mining engineers of the Norton Co., Worcester, Mass., has returned from a six months' trip to the British, Dutch and French Guianas, South America. Three others of the sales department have already returned and several others are still there on an exploration expedition.

George W. Llewellyn, for a number of years secretary of the Joyce-Cridland Co., Dayton, O., has left that company to become associated with the Crucible Steel Co. of America as its Dayton representative.

John R. Foster, for several years connected with the Allen S. Davison

WILLIAM K. KENLY

Co., Pittsburgh, has resigned to become associated with the Iron & Fuel Trading Co., which recently opened offices in the First National Bank building, that city.

M. M. Duncan, vice president and general manager of the Cleveland-Cliffs Iron Co., has been reappointed a member of the board of control of the Michigan College of Mines by Governor Sleeper. Mr. Duncan has served on the board for several terms.

Sir Robert Hadfield, the English steelmaster, has been granted a baronetcy on the occasion of the king's birthday. His scientific achievements especially in the production of manganese steel have made him well known in steel circles in this country.

Jay C. McLauchlan, for many years Michigan representative of Pickands, Mather & Co., now is associated with the company at Cleveland. He has been succeeded by H. E. Blackwell as district sales manager, with office in the Penobscot building, Detroit.

Clayton A. Plumb, head of the tap department of the Wiley & Russell Co. division of the Greenfield Tap & Die Corp., Greenfield, Mass., has been succeeded by David R. Mowry, one of the New England salesmen.

Edwin P. Brown, general manager of the United Shoe Machinery Co., Boston, has been elected president to succeed Sidney W. Winslow, deceased. Sidney W. Winslow Jr. has been made vice president and H. G. Donham, formerly secretary, a director and vice president.

Arthur N. Dugan has been made vice president of the Bronze Metal Co., 30 Church street, New York. Mr. Dugan has been with the Bronze company for the past three years, having previously been associated with the late J. C. Stuart, vice president of the operating department of the Erie railroad.

W. R. Day, for some time general manager of the Hart-Parr Co., Charles City, Ia., has been elected vice president of the company, succeeding A. E. Ellis, resigned. Donald D. Davis has been elected secretary to fill the vacancy existing by the appointment of C. H. Parr to the position of chief engineer.

Michael O'Hayer, for the past 12 years connected with the North & Judd Mfg. Co., New Britain, Conn., in various responsible positions, has been appointed general superintendent of manufacturing, succeeding Herbert A. Johnson, who resigned to accept appointment to the United States government committee in charge of hardware manufacturing.

B. M. W. Hanson, vice president and works manager of the Pratt & Whitney Co., Hartford, Conn., has resigned after 19 years service with the company and has accepted a similar position with the Colt's Patent Firearms Mfg. Co., in the same city, taking the position formerly held by F. C. Chadwick, factory manager. Mr. Hanson also has resigned from

the machine gun board appointed by the federal government but he will continue to give the latter the benefit of his services, as far as his new duties will permit. He had been serving as a member of the engineering branch of the national council of defense and is chairman of the subcommittee on rapid fire and also on machine guns.

S. H. Chauvenet, formerly identified with the Robesonia and Sheridan furnaces in eastern Pennsylvania, will act as manager at the Island Park furnace, Easton, Pa., recently purchased by the Northern Ore Co. Mr. Chauvenet has had a wide and successful experience in the operation of mines and in the manufacture of pig iron.

C. A. Richards, of New York, has been chosen chief of the division of export business by Secretary of Commerce Redfield. This division will supervise the granting of licenses under the authority vested with the President to control exports. Mr. Richards has been engaged in the export and import trade throughout his business career.

Charles S. Clark, formerly of the Pennsylvania Steel Co., Boston, has been elected first vice president and general manager of the Laconia Car Co., and will make his headquarters at Laconia, N. Y., where the business of the company will be conducted hereafter. Mr. Clark has been well known to the New England railroad, electric railway and steel business for many years.

Bryand H. Blood, works superintendent of the Celluloid Co., Newark, N. J., has succeeded as general manager of the Pratt & Whitney Co., Hartford, Conn., B. M. W. Hanson, who has been made vice president and general works manager of the Colt's Patent Fire Arms Mfg. Co., Hartford. F. O. Hoagland is manager and assistant at the Pratt & Whitney plant. Harry E. Bailey, Cromwell, Conn., private secretary to Mr. Hanson at the Pratt & Whitney plant accompanied him to the office which he now occupies.

M. L. Sternberger Jr., president of the Wellston Iron Furnace Co., Jackson, O.; S. E. Sternberger, vice president and general manager of the same company and members of the Sternberger family have filed a petition in court for permission to change their surname to Stephenson for patriotic reasons. M. L. Sternberger Jr. is second lieutenant of the Jackson county battery F and will leave for Fort Benjamin Harrison on July 15 for training.

M. Cochrane Armour, who for more than 25 years has had a prominent career both as a producer and distributor of pig iron, especially in Chicago and western territory, has withdrawn from the firm of Rogers, Brown & Co., a short time ago. By this action Mr. Armour severed a connection of almost 27 years as a partner in that firm to which he was admitted in December, 1890. He has represented the Rogers, Brown interests in the Chicago district for many years. In 1899, when the Iroquois Iron Co. was organized to acquire and build blast furnaces at Chicago, he became its president and continued until the recent sale of the property to a group of interests. He also has been vice president and director of the Rogers, Brown Iron Mining Co., director of the Rogers, Brown Ore Co., Chicago

M. COCHRANE ARMOUR

Short Line Railway Co., and the Lake Superior Iron & Chemical Co. He is identified prominently with various educational, religious and social organizations at Chicago including membership on the board of trustees of the Northwestern university. Mr. Armour was born in Auburn, N. Y., and was educated in the public schools of Marshall, Mich. He became a clerk for a firm of grain merchants, later conducted a merchandizing business, and in 1878 became identified with the Adams & Westlake Mfg. Co., Chicago, manufacturer of metal specialties. His partnership in Rogers, Brown & Co. dates from 12 years later. The remaining partners of the firm, it is announced, are William A. Rogers, A. A. Fowler, W. T. Shepard, D. B. Meacham, J. K. Pollock and E. L. Billingslea.

# Crude Methods

### Of Chinese Mining and Sampling Hold Back Ore Commerce

Chinese commercial and mining methods are preventing further development of the metals and minerals of that country. A source of the difficulty is the crude method of sampling ores now in use in that country. Ore purchased for export to the United States or Europe is valued only for its **metallic content** and there is consequently a great risk involved to native brokers since they buy at auction, without an exact knowledge of the metallic content of the ore. In addition to those at Canton, Wuchow and other South China points, during the past year, works have been erected at Sam Shui for handling antimony regulus. Exports of magnetite from Kiung Chow and manganese exports from Pak Hoi also are reported.

The present unscientific basis of handling ores has hindered the development of trade with the United States and Europe, but has worked to the advantage of Japanese smelters and importers.

Much Chinese ore now is being sold to Japan, as the latter alone are active as buyers. The readiness with which Japanese purchasers can obtain a proper analysis of ore accounts for much of the advantage they possess. Antimony exports have continued in recent months in spite of the collapse of the market for ore. Exports of antimony from Hongkong to the United States during the January-March period of the present year were 335,504 tons, valued at $37,442, while exports during the same interval of last year were 313,545 tons, valued at $80,771. Regulus and crude antimony exports in 1916, from all China aggregated 24,727 tons with a value of $9,340,567, compared with 23,933 tons valued at valued at $2,893,436 in 1915. Total exports of antimony ore in 1916 were 12,968 tons valued at $1,092,762 compared with 1842 tons valued at $83,025 in 1915.

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Spanish railroads at the beginning of 1916 possessed the following rolling stock: Two thousand six hundred and eighty-three locomotives, 6390 passenger cars and 59,454 freight and cattle cars, the combined capacity of the freight and cattle cars was 593,540 tons. A proper distribution of the rolling stock, it is said, would enable the transportation of a much larger amount of merchandise. Poor warehouse and storage facilities are responsible for a great deal of the inefficiency of Spanish transportation.

# Sales of American Steel Are Blocked

## British Buyers Willing to Pay Liberal Prices But Balk on Assuming Freight Risk From This Side—Supplies Scarce Even for War Purposes—Pig Iron Conditions Mixed Due to Irregular Advance

Bureau of The Iron Trade Review,
Prince's Chambers, Corporation St.,
Birmingham, Eng., July 1, 1917.

STEEL is hardly obtainable even for war purposes. A certain amount of negotiations and discussion has been in progress between Birmingham merchants and American houses relative to imports of semi-finished steel. A Birmingham merchant has this week been quoted from America as follows: Wire rods, $93; billets, $90; low phosphorus pig iron, $89, all f.o.b. New York. No business seems likely to result. The price is decidedly high, but the barring element is the restriction by American exporters of their offer to "New York f.o.b" conditions. The British importer does not care to run the risk involved by speculative shipments, which, in fact, impose upon him the entire onus of conveyance from New York harbor to the destination of the steel. For the present, the business is suspended and merchants here are not very hopeful that it will in any way materialize, although there is no doubt about the urgency of the demand and the willingness of British consumers to pay fairly high prices.

### *Not Asking Higher Prices*

There is some unrest in the finished iron department over the addition to cost of production involved by the rise of 5s ($1.20) per ton in Staffordshire part-mine material. When this was conceded there was a somewhat hasty assumption that all pig irons would be put up to the same extent, and a strong opinion was expressed by mill owners that an application should go to the ministry for a general revision of finished iron prices. The amount suggested was 10s ($2.40) per ton. It now appears very uncertain whether the ministry will make any advance in other pig irons, and already there is a sign of reaction among finished makers on the question of revised prices. For many months past they have held as a sort of general principle that the putting up of finished prices merely establishes a sort of vicious circle, pulling up wages and subsequently necessitating still higher prices. "Second thoughts" seem to have been prevalent during the week which has followed the pig iron advance, and it is now very doubtful whether any application will be made. Manufacturers view with the greatest repugnance anything likely to stimulate the already extravagant wages which so greatly increase all the difficulties of managers.

Orders are plentiful for all kinds of finished iron. Big tonnages constantly are being offered which makers are obliged to cut down, and present bookings will easily carry them on toward the end of the year. There is some grumbling over the insistence by manufacturers of full prices for cut lengths. This is a matter on which there seems to have been some laxity in the past, and now that makers are in a commanding position they mean to pay themselves for the trouble and extra waste involved by cutting to dead lengths bars and small iron. There is an enormous business being done in sheets for working up, especially with Birmingham houses who produce such a vast variety of war equipments of various descriptions. The government is taking nearly all the supplies of this material. Owing to the scarcity of billets, large quantities of discard steel are being used for various descriptions of finished goods.

Sheets are in fairly good demand, but with a decided preference for painted sheets as compared with galvanizing. Galvanized sheets are an increasingly difficult problem owing to the tight hand which the government is maintaining upon spelter. When an order is accepted the date of delivery is extremely problematical. However, the sellers of painted sheets have this week increased their charges for painting from £1 ($4.80) to 25s ($6).

### *Scotland is Busy*

Scotland keeps extremely busy, the whole of its steel output going directly or indirectly to the government. Export business is restricted practically to the needs of France and Italy. There is an enormous output of malleable material for war purposes. The tinplate trade is active, with demand greatly in excess of the supply. There are great difficulties in getting sufficient raw material to maintain in operation even the small proportion of mills still running. For standard sizes of tinplates under class "A" certificates 35s ($8.40) to 36s ($8.64) is obtained, while any free parcels easily command 40s ($9.60) and upward.

The very hot weather is materially affecting the output of the forges and mills, and to some extent the restriction of beer is having an influence. Government restrictions on the trade, arising from reduced imports, the cutting down of grain supplies and other matters have compelled a great many public houses to exhibit for the first time in their history notices, "All draught ale sold out.". The stoppage of beer is causing some workmen to neglect their work, on the ground that they cannot carry out this arduous labor without their usual refreshment. In some works what is called a "wet canteen" has been established, in which a light malt drink, almost non-intoxicating, is being supplied and the system is said to work well.

### *Develop New Helmet Type*

Messrs. Hadfields, Ltd., Sheffield, who with three other Sheffield firms have been producing the bulk of the steel helmets for British troops, made of a special steel by a secret process, have now acquired the patent rights for the manufacture of a new type of helmet. The original helmets were stamped out of steel of a specially light character, possessing the maximum resisting power to rifle fire and shell splinters. The new helmet will have an outer shell or casing of a hard, tough steel, with an internal arrangement of india rubber, cork, etc., which will insure comfort for the wearer. The helmet will fit lightly, but at the same time furnish better protection against head wounds.

The position in regard to pig iron continues somewhat chaotic in view of the advance to Staffordshire by the ministry of munitions without concession to any other. The Staffordshire makers are quoting the 5s ($1.20) advance which makes part-mine forge £5 ($24) and foundry iron £5 2s 6d ($24.60). They have also been able to enforce their retrospective bargain, applying the advance to all transactions from the beginning of April. These makers can sell all the iron they make, and indeed that is a general condition. But this partial advance has placed the makers of finished material in a very awkward posi-

tion. They are alleged to pay more money for their pig iron and make constant advances in wages without getting anything on finished iron.

They cannot apply for a revision in finished rates, however, when four out of five of the pig iron districts, whose material is so largely used, are not permitted to raise their prices. It seems quite possible that the ministry of munitions will go no further in the way of concession. Derbyshire and Northamptonshire makers are not at all hopeful that they will now get the advance, and indeed they seem to have reconciled themselves with the consolation that the buyers will now go to those who sell more cheaply than the others. There does seem to be a certain amount of transfer of business from Straffordshipe, Northamptonshire and Derbyshire. Northampton, anyway, has always been halfhearted in regard to this application for higher prices, on the ground that if prices become at all excessive this is the district whose iron is likely to get left, particularly in competition with Derbyshire. There is a very large demand for foundry iron for government contracts, all the foundries being fully employed.

*Conditions are Easier*

In the Cleveland district supply and demand are more equally balanced than for a long time. Consumers generally get what they want, while Scotland, with somewhat better railway service, is getting larger supplies. This is also true of the allies since makers have more iron to spare. This should have an effect upon the shipment returns for the present month. There is a slight decrease in warrant stock, which now amounts to only 1365 tons. Quotations in that district are unchanged. The demand for hematite is extremely keen. Makers find it difficult in the Midland district to keep up the regularity of supply. To some extent, output is limited by fuel scarcity although the blast furnaces generally fare better than the forges and mills in this respect.

## Canadian Electric Steel Plant Near Completion

Toronto, July 9.—Great progress has been made in the construction of the extensive steel plant of the British Forgings, Ltd., on a site of 130 acres on the lake front in the Ashbridge Bay industrial district of Toronto. Ground was broken during the first week in February, and since that date the work has been so energetically pushed that one of the furnaces has been completed and was put into operation on the 18th ult. There are 10 furnaces in all and the remainder are nearly completed. The total capacity will be from 300 to 400 tons of steel per day. The raw material is scrap steel which is remelted by the electric process. The total requirements of electricity when all the furnaces are in operation will be approximately 22,000 horsepower, which is furnished by the Toronto hydroelectric system. This is about one-half the hydroelectric power used by the entire city. The plant has about 5000 feet of modern dockage on the water front providing for a draught of 24 feet of water. It faces on a 400-foot ship channel now under construction.

## Sharp Fall

**Shown by Ferromanganese Imports in May—Ferrosilicon Increases**

Marked falling off in the imports of ferromanganese from England during May are shown by advance figures of the bureau of foreign and domestic commerce, department of commerce. The quantity was only 2019 tons as against a monthly average of 6784 tons for the 11 months of the fiscal year, or a total of 69,924 tons for that period. Imports of ferrosilicon showed a large gain, amounting to 1114 tons for May, compared with an average of 713 tons for each of the preceding 11 months. In May, 1916, these imports amounted to 417 tons. Increasing quantities of manganese ore imports, coming chiefly from Brazil, are shown. The total for May, 1917, was 81,269 tons, and for the 11-month period 593,310 tons, compared with 74,825 tons for May of last year and 434,717 tons for the 11 months of the fiscal year 1916. These figures, together with those just given out by the geological survey showing the domestic output of manganese ore for 1917 will treble that of 1916, reflect the increased production of ferromanganese in this country.

Imports of various ferroalloys and ores, in gross tons, follows:

| | | | Eleven months ending | |
|---|---|---|---|---|
| | May, 1917 | May, 1916 | May, 1917 | May, 1916 |
| Ferromanganese.. | 2,019 | ..... | 69,924 | ..... |
| Ferrosilicon .... | 1,114 | 417 | 7,846 | 4,933 |
| Manganese ore.. | 81,269 | 74,825 | 593,310 | 434,717 |
| Tungsten bearing ore ..... | 404 | ..... | 3,480 | ..... |
| Nickel, nickel oxide and matte..... | 2,453 | 2,675 | 29,549 | 27,969 |

| | | | Eleven months ending | |
|---|---|---|---|---|
| | May, 1917 | May, 1916 | May, 1917 | May, 1916 |
| Ferro-tungsten & tungsten metal. | 207 | ..... | 719 | ..... |
| Ferrovanadium... | 139 | 99 | 1,077 | 437 |
| Nickel, nickel oxide and matte..... | 806 | 1,627 | 13,039 | 10,428 |

## Obituaries

James R. M'Master, sales manager of the Sefton Mfg. Co., died recently at his home in Oak Park, Ill.

Walter Weakley, superintendent of the Union Tool Co., West Chicago, died recently, aged 42 years.

Edward A. Turner, formerly president and one of the founders of the Link Belt Co., died recently at Chicago, at the age of 67 years.

Joseph V. Kunze, civil engineer and vice president of the Pelton Water Wheel Co., died lately at his home in Brooklyn, aged 54.

Clarence Stryker Volckening, secretary to the controller of the United States Steel Corporation, died of heart disease recently at his home in Brooklyn, aged 25 years.

James Whitfield Wood, vice president and treasurer of Tippett & Wood Inc., Phillipsburg, N. J., boilermakers, died recently after 40 years of continuous service with the company.

James H. Johnston, aged 80 years, organizer of the Western Gun Works, with which he was actively connected for more than 50 years, died at his home in Pittsburgh, lately.

Michael F. McMahon, maker of friction clutches, pulleys and couplings, under the name of McMahon & Co., Worcester, Mass., died at his home in that city lately, after a lingering illness.

John Bennett, vice president and general manager of Coates, Bennett & Reidenbach, Inc., Rochester, N. Y., died suddenly recently. Mr. Bennett entered the iron and steel industry over 20 years ago as an office employe of the Genessee Metal Co. He was prominent fraternally and had a wide acquaintance with men of the trade.

James Johnson Peard, for nine years superintendent of the Colt's Patent Firearms Mfg. Co., Hartford, Conn., died at his home in that city, July 3, aged 68 years. He became assistant superintendent of the Colt Co. in 1888, superintendent in 1902 and retired in 1911 because of ill health. He was the inventor of several firearms improvements and was an authority on small arms.

W. C. Scofield, for many years president of the Lake Erie Iron Co., Cleveland, manufacturer of bar iron, nuts and bolts, and a pioneer in the manufacturing development of that city, died at his home in Cleveland, July 5, aged 95 years. He retired from active business many years ago but retained until his death the presidency of the Lake Erie Iron Co., which he had held for a period of 45 years.

# Iron and Steel Financial News

**Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers**

# Profit Taxation Absorbs Business Mind

BUSINESS generally as well as Wall Street is immersed in study of the federal excess profit taxing scheme, and the government's policy as to price fixing. In the meantime the stock market is sluggish. A few weeks ago, before subscriptions to the liberty loan were closed, predictions of inflation in the prices of commodities and stocks were frequent, in view of the heavy government buying of war materials, then impending. The big credit was established successfully and the government buying is of the broadest scope; but the predictions of inflation have not materialized. Industrial activity already was at top notch and our participation in the war has brought about concentration of energies in certain lines essential in the conduct of the war. But the government buying is not as profitable as orders placed by private consumers and by the allies. The question as to what the government's price policy will be is one leading cause for the stock market's uncertainty.

Great interest is being manifested in the excess profit taxing program. The war revenue bill, as redrafted by the senate finance committee, shows marked changes over the house bill. The tax-gatherer will claim a large share of industrial profits, especially among the iron and steel producers, but once the financial community is assured that the corporations still will be allowed to make a living, the markets may view the outlook more cheerfully. The war revenue bill will be considered by the senator after the food control is finished. It may undergo some change in the senate or later in conference, but it is probable the principle of excess profit taxing, as now embodied, will be retained.

During the listless trading on the stock market, Wall Street statisticians have much spare time on their hands and some of them are using it to figure how much the government will take from the United States Steel Corp. and other iron and steel producers. The process looks fairly simple; but there are so many factors not yet clearly determined, such as the actual earnings for the next three quarters, the tonnage being supplied the government and the possibility of further changes in the bill, that the results leave the investor still greatly perplexed as to how the value of his stock will be affected.

## Navy Takes Bids for New Plant and Shells

Washington, July 10.—Proposals for a large number of projectiles will be received by the bureau of ordnance of the navy department July 11. The list calls for not less than 560,000 and not more than 840,000 of 4-inch projectiles; 650,000 of 3-inch projectiles and 300,000 of 6-inch projectiles, class B. The bureau also will receive proposals up to July 25 for 15,000 6-inch common projectiles.

Bids will be taken by the bureau of yards and docks of the navy department July 16 for the construction of four buildings, including machine shop, foundry, forge shop and heat treatment plant to form a part of the new naval projectile works to be built at Charleston, W. Va.

## American Rolling Mill Co. Takes Ohio Charter

The American Rolling Mill Co. of New Jersey, Middletown, O., has surrendered its New Jersey charter and reincorporated in Ohio with $8,800,000 capital under the title of the American Rolling Mill Co. of Ohio. This step is preliminary to the taking over of the Columbus Iron & Steel Co., a $1,500,000 corporation, at Columbus, O. The Columbus company was incorporated in Ohio in November, 1899 and the rolling mill company was incorporated in New Jersey in December, 1899. The reincorporation of the rolling mill company under Ohio laws has been effected in order save the taxation imposed on foreign corporations by Ohio laws.

## Rifle Contract Cause of Plant Receivership

Edwin W. Higgins, vice president and William J. Garcey, controller of the Hopkins & Allen Arms Co., Norwich, Conn., and Lewis D. Parker, treasurer of the Billings & Spencer Co., Hartford, Conn., have been appointed receivers of the former company by Judge Edwin S. Thomas of the United States district court in New Haven, Conn., on petition of the Billings & Spencer Co., Hartford, Conn. The latter is a creditor to the extent of $54,664 for merchandise. It alleges the Hopkins & Allen Arms Co. also owes a mortgage note of $200,000 to Charles R. Butts and three different mortgages to Pierre Mali, for $1,250,000, $1,300,000 and $1,012,500. Other obligations of $500,000 are reported. The financial troubles of the company are said to be due to taking a contract for Mauser rifles for the Belgian government at too low a price. This called for 140,000 rifles at $27 each and 10,000 at $28 each. About 11,000 have been delivered. The receivers will continue to operate the plant.

## Capital is Increased for Proposed Texas Mill

Houston, Texas, July 10.—At a meeting of stockholders of the Texas Resources Development Co., held here, the directors of that corporation were authorized to increase the capital stock from $4,000,000 to $6,000,000. This company is preparing to build an iron and steel plant at Beaumont and it is stated that the proceeds from the sale of the additional stock authorized, will be used to make the proposed plant considerably larger than originally contemplated. The site for the industry and proposed terminals now is being cleared. The company owns large deposits of high-grade iron ore in Cass and Marion counties in East Texas and it has opened up mines from which the ore supply for the proposed new plant will be obtained.

## Plans Steel Plant

The Smelters Steel Co., Seattle, organized recently, has elected the following officials: G. Lewis Casey, president; F. W. Ferch, vice president; T. H. Pidduck, secretary and treasurer. The capital is given at $1,500-

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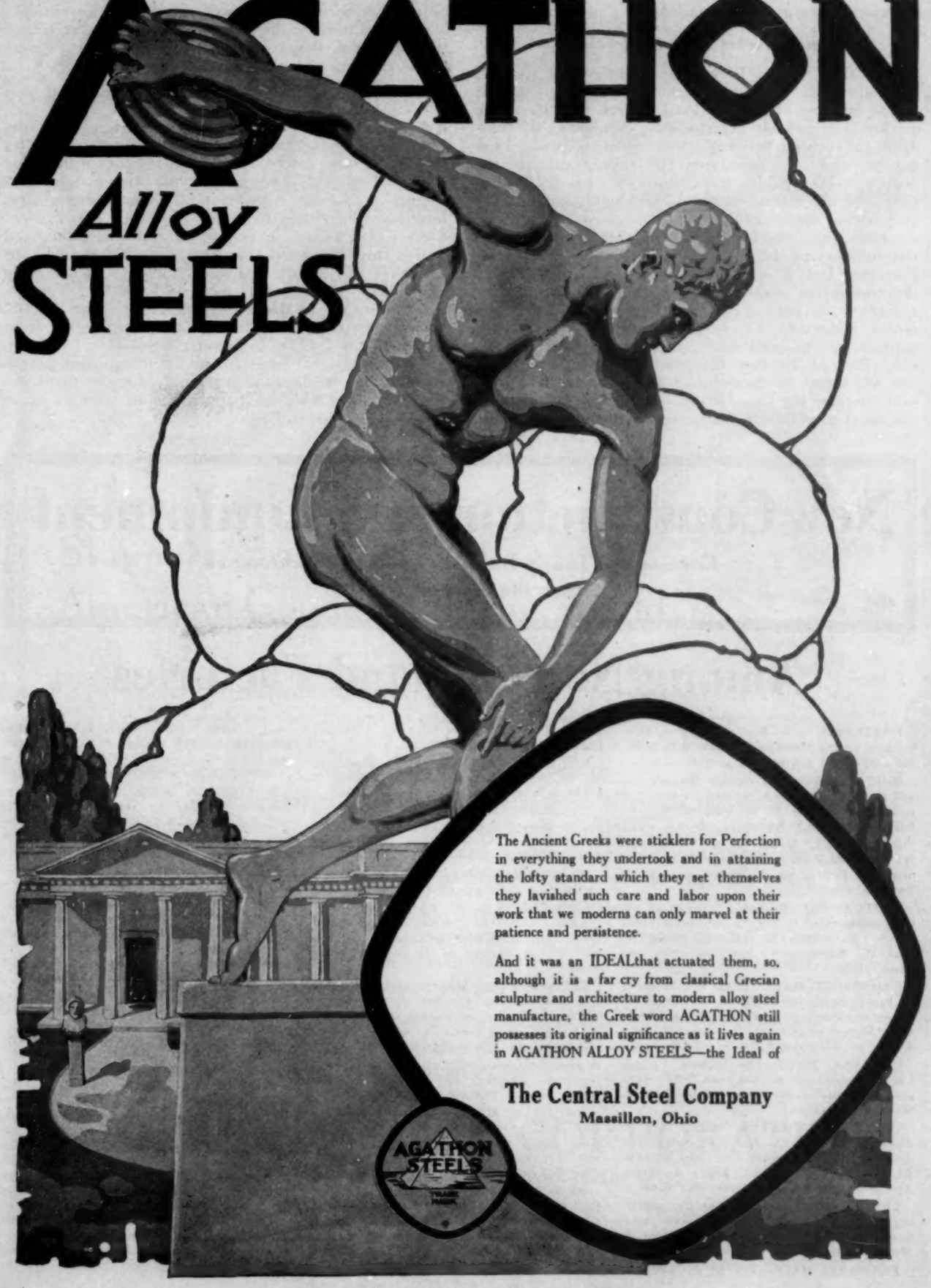
# AGATHON

## Alloy STEELS



The Ancient Greeks were sticklers for Perfection in everything they undertook and in attaining the lofty standard which they set themselves they lavished such care and labor upon their work that we moderns can only marvel at their patience and persistence.

And it was an IDEALthat actuated them, so, although it is a far cry from classical Grecian sculpture and architecture to modern alloy steel manufacture, the Greek word AGATHON still possesses its original significance as it lives again in AGATHON ALLOY STEELS—the Ideal of

**The Central Steel Company**
**Massillon, Ohio**

AGATHON STEELS
TRADE MARK

*Say you saw it in* THE IRON TRADE REVIEW

and very few new factories are being erected, so that the normal sales of machine tools to satisfy such requirements are greatly curtailed.

*Lathe Market Eases in Cleveland*

ACCORDING to Cleveland machine tool dealers, the lathe situation is easing considerably and it is the opinion of several local houses that the lathe market is at present overstocked. A number of companies have been building lathes exclusively for some months and on some types the supply exceeds the demand. Heavy-duty tools, however, are the exception, and the market has been thoroughly combed for large-swing machines for munition plants. Engineering tools, including boring mills, planers of large type, slab millers and shipbuilding machines are scarce. The Feenburg Iron & Metal Co., Tulsa, Okla., has entered the market for shears, cranes and like equipment for a large scrap yard. The Schwartz-Van Wormer Co., North Ridgeville, O., is completing a plant for the manufacture of small tools, including expansion reamers. Part of the shop equipment has been purchased, but additional machinery is being sought. The General Engineering Co., Detroit, states that it will be in the market in about three weeks for machine tools. The General Motors Co., Detroit, has issued a similar inquiry stating that a large number of shop tools will be purchased. The Cromwell Steel Co., Lorain, O., is expected to enter the local market in the near future for additional shop equipment. The Cromwell Steel Co. is erecting a modern steel plant at Lorain.

*Heavy Buying of Lathes Expected in Pittsburgh*

MACHINE tool dealers at Pittsburgh express the belief that contracts for a great many lathes shortly will be placed by concerns filling orders for shells. Tentative inquiries for munition-making machinery are under consideration. The Westinghouse interests, the Standard Steel Car Co., the Pressed Steel Car Co. and several other concerns who filled orders for munitions for the allies, likely will be active factors in the machinery market at an early date. The Youngstown Sheet & Tube Co., Youngstown, last week placed contracts for four electric traveling cranes, having lifting capacities ranging from 10 to 40 tons. The Edgewater Steel Co., Oakmont, Pa., has completed plans for an additional open-hearth furnace and is installing machinery for the manufacture of car wheels and appliances of various types intended for railroad use.

# New Construction and Equipment

**Concise and Timely Business Building Opportunities from the Field of Industry**

## Among New England Factories

PORTLAND, ME.—The Cumberland Shipbuilding Co. has been incorporated with $500,000 capital and will equip a yard at once.

BOSTON.—The S. A. Woods Machine Co. will build a brick and concrete, 1-story, 90 x 100-foot addition to its machine shop on Earle street, South Boston.

BROOKLINE, MASS. — M. W. Quinlan Jr., will build a brick and reinforced concrete, fireproof, 3-story, 60 x 100-foot factory on Boylston street.

BOSTON.—The Bankers' Realty Co. has been incorporated to build a mercantile building in Worcester with $750,000 capital by John W. Worthington, Stuart C. Rand and Diana Daffin.

CAMBRIDGE, MASS.—Plans will be ready to figure shortly for a brick and reinforced concrete, 5-story, 60 x 80-foot and a 2-story, 40 x 60-foot addition to the plant of Swift & Co., on Gore street.

CHELSEA, MASS.—The Dighton Furnace Co., capitalized at $25,000, has been incorporated to manufacture furnaces by John R. McNary and others.

EAST BRIDGEWATER, MASS. — The Carver Cotton Gin Co. has been incorporated to make cotton machinery with $600,000 capital by Henry F. Knight, Ripley L. Dana, Arthur F. Johnson and Harvey W. King.

FRAMINGHAM, MASS.—The International Engineering Works Inc., has been incorporated with $500,000 capital by Willard B. Hamlin, Leland Wells Pollock and J. A. Hay.

PEABODY, MASS.—The A. C. Lawrence Leather Co. will build a brick, 30 x 140-foot addition to its power house.

HOLYOKE, MASS.—The Valley Paper Co. has let the contract for a brick, 2-story, 49 x 84-foot power house to cost $50,000.

MEDFORD, MASS.—The Teel Mfg. Co. has let the contract for a reinforced concrete, 1-story, 68 x 125-foot building at Main and Emerson streets.

MEDFORD, MASS.—The city has let the contract for a 3-story, 65 x 125-foot city hall to cost $500,000.

NEW BEDFORD, MASS. — The Morse Twist Drill & Machine Co. has let the contract for an addition to its plant on Wing street.

SPRINGFIELD, MASS.—The Van Norman Machine Tool Co. has let the contract for an addition to its factory and storehouse at 160 Wilbraham avenue, to cost $17,000.

SPRINGFIELD, MASS. — The Smith & Wesson Associates has let the contract for a reinforced concrete, 5-story, 60 x 200-foot factory to cost $100,000 on Willow street.

WALTHAM, MASS.—The Auto Parts Mfg. Co., capital $50,000, has been organized to make auto accessories. The incorporators are: Charles J. Batchelder, Hugh W. Batchelder and John Wylie.

WORCESTER, MASS.—Burgess, Lang & Co., Boston, will build a reinforced concrete, 8-story, 130 x 119-foot mercantile building at Commercial and Mechanic street.

WORCESTER, MASS. — The Bankers' Realty Co., Boston, has been incorporated to build a terra cotta, 11-story, 109 x 175-foot mercantile building to cost $2,000,000, including the land, at Main and Walnut streets. Albert O. Hagar is president of the company.

WORCESTER, MASS. — The Worcester Foundry Co. has let the contract to the Mill Engineering & Construction Co., Waterbury, Conn., for a 1-story, 52 x 198-foot foundry to cost $30,000 at 180 Prescott street.

WESTFIELD, MASS.—The J. H. Fowler Co. has let the contract for a 1-story, 34 x 87-foot addition to its plant.

NEWPORT, R. I.—Martin F. Kelly, New York, has been awarded the contract by the United States government for three steel and concrete, 2-story, 50 x 150-foot storage buildings to cost $100,000 at the naval station.

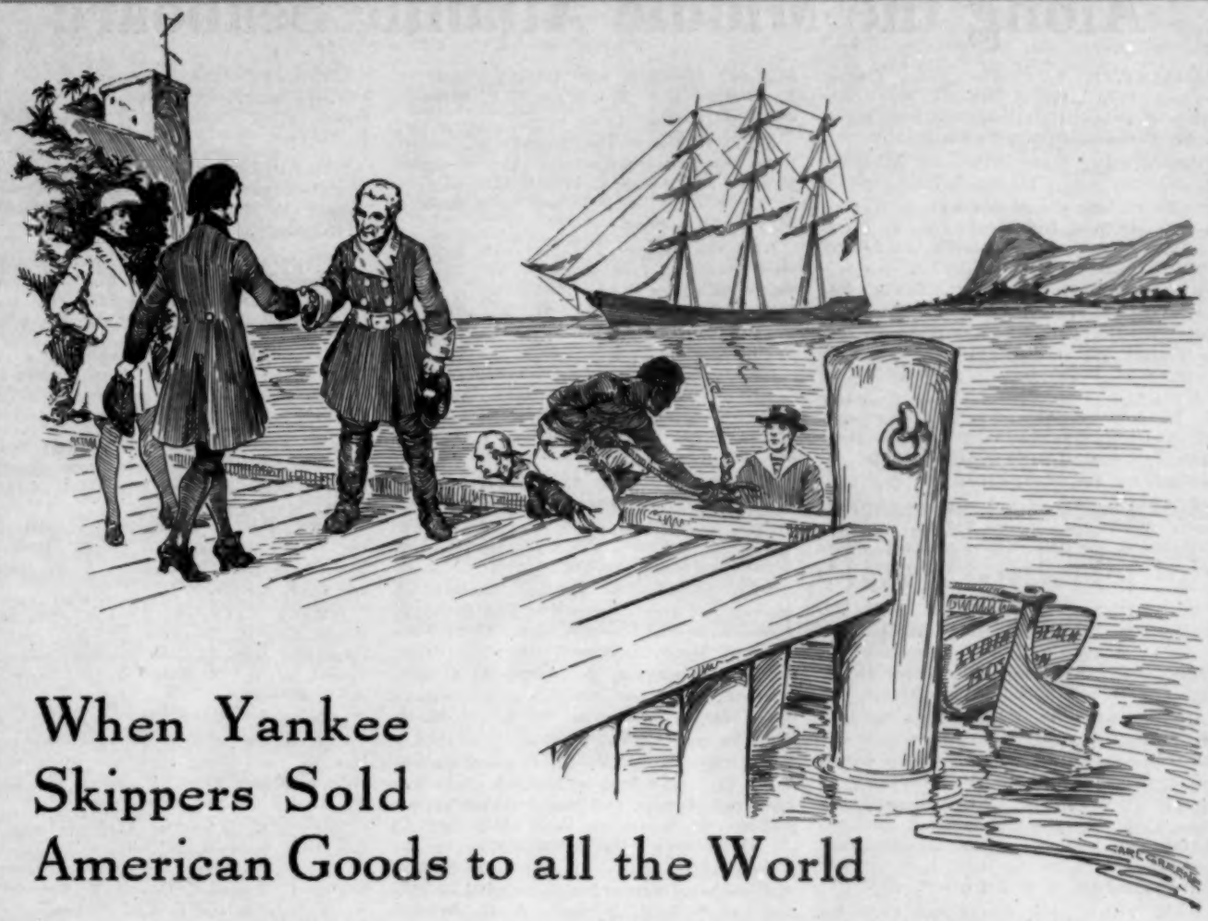
PROVIDENCE, R. I.—The Rhode Island Tool Co. has let the contract for a 1-story, 63 x 109-foot addition to its forge shop.

BRISTOL, CONN.—The Bristol Brass Co. has let the contract for a 50 x 120-foot addition to one of its mills on Broad street.

BRISTOL, CONN.—The Clayton Mfg. Co. has been incorporated with $75,000 capital by William M. Bowers, Frederick C. Winter and William R. Bowers.

GREENWICH, CONN.—The Connecticut Engineering & Metal Products Co. has been incorporated with $7500 capital by Ambrose M. Boles, Raymond M. Boden, and Charles C. Schoen.

NEW BRITAIN, CONN.—The New Britain Machine Co. has let the contract for a 2-story, 38 x 260-foot addition to its factory on Chestnut street to cost $30,000.



# When Yankee Skippers Sold American Goods to all the World

It's difficult to imagine a more satisfactory export service than that provided by these old shipmasters. They trimmed off all the non-essentials in their dealings with the New England manufacturer and with their customers overseas. They paid cash for the goods they took abroad, and with their cargoes below decks, they sailed for the ports where the market was ripe.

It was their part to do the selling and adjustment of credits and exchange, leaving the American Manufacturer undisturbed in the skillful production of his goods. Through the efforts of these early traders, many of our great manufacturing plants received the timely support that made them what they are today.

The Federal Export Corporation does business on this old Yankee plan—It is a shipowning, selling and financing organization. We delegate no part of our work to outside concerns and in consequence, we provide the most direct channel from your factory to your customers abroad.

Some day you will have recourse to a service of this kind—wouldn't it pay you to get in touch with us now when such preparedness will make it easier for you to accept the orders that come from our selling staff overseas?

## FEDERAL EXPORT CORPORATION

115 Broadway, New York City

Shipowners Exporters Bankers

# Along the Middle Atlantic Seaboard

ALBANY, N. Y. — The Seneca Electric Furnace Corp., capital $100,000, has been chartered to manufacture electric furnaces by F. W. Cameron, P. and E. Corning.

BROOKLYN, N. Y.—The W. B. Perry Electric Co., capital $75,000, has been organized for the purpose of engaging in a business as electrical engineer by W. B. Perry, V. V. Shorey and G. B. Smith, 55 Liberty street.

BROOKLYN, N. Y. — The E. K. Die Works Inc., has been organized for the manufacture of dies with $10,000 capital. C. and E. Klagges and G. J. Ellisberg, 371 West Twenty-third street, are the incorporators.

BUFFALO.—The Efficiency Gas Generator Co. has been incorporated with $50,000 capital to manufacture gas and oil generators. G. Van Damm, J. H. Stevens and W. H. Godbold are the incorporators.

BUFFALO.—The J. D. Cousins & Sons Boiler Works Inc., capital $50,000, has been incorporated to make boilers, engines, tanks and machinery by J. D. and J. and L. A. Cousins.

FLUSHING, L. I.—The Tock Screw Machine Products Corp. has been chartered with a capital of $50,000 to make automatic machine screws and machine parts by H. A. Tremaine, C. and R. and V. O. Tock.

HEMPSTEAD, N. Y.—The Peterson Storage Battery Co. has been incorporated with $10,000 capital to manufacture storage batteries by C. and J. H. and A. Peterson.

NEW YORK.—The United States Aeroplane Corp. has been incorporated with $1,000,000 capital to manufacture aeroplanes and equipment, by J. M. Garbajal, J. A. Weldon and I. Ornstein, 5 Willett street.

NEW YORK.—The Anti-Creeper Corp. has been organized to manufacture railroad supplies and appliances with $150,000 capital by E. L. Mills, J. A. McKee and J. F. Bardwell, 260 West street.

NEW YORK. — The Super-Diesel Tractor Corp. has been organized with $10,000 capital to make farm tractors and farm machinery by C. A. Lewis, R. A. Budd and E. A. Rumely, 25 City Hall Place.

NEW YORK. — The McCarthy Drill & Tool Corp. has been organized with $325,000 capital to engage in the manufacture of drills, tools and machinery. C. H. McCarthy, B. E. and O. S. Mitler, 30 Church street are the incorporators.

NEW YORK.—The Lambert-Georgin Chemicals Corp., capitalized at $100,000, has been chartered to make chemicals. F. Kriegel, M. Hotchner and L. F. Corea, 56 Pine street are the incorporators.

NEW YORK.—C. & A. Hoffman, Inc., has been chartered with $25,000 capital to make cutlery. The incorporators are: A. P. Zipoli, W. A. Schindler and L. K. Mayer, 1307 Putnam avenue, Brooklyn.

NEW YORK.—The Decalmo Machine Co. recently has been chartered in New Jersey to make machinery of all kinds by Lincoln Krueger, Morris Grossman, Harry G. Hecht.

PORT CHESTER, N. Y.—The A. A. Mills Brass Co. has been chartered to manufacture brass and other alloys by W. A. and W. A. Mills Jr. and C. W. Stevens.

RICHMOND, N. Y.—The Jupiter Machine Mfg. Co., capitalized at $50,000, has been chartered to make punching and shearing machines. E. A. Dippel, C. A. Stich and G. N. Thompson are the incorporators.

CARLISLE, PA. — The National Castings Co. has been organized with a capital of $50,000 by Jacob H. Foreman, A. G. Bashoar, R. Morrett and Walter R. Sohn.

KNOX, PA.—The Furnace Co. has been chartered with $10,000 capital by W. I. McDowell, B. H. Thomas, H. J. Slicker and H. K. Dietrick.

PHILADELPHIA.—The Marine Brass Co., capitalized at $10,000, recently has been organized by James S. Fulton, Samuel H. McLaughlin, and Lynford C. Roberts.

PHILADELPHIA. — The National Alloy Co., capitalized at $250,000, has been granted a state charter. The incorporators are Henry P. Miller, William J. Miller and others.

PHILADELPHIA.—C. Hammond & Son, Inc., capital $10,000, has been chartered to manufacture tools, hammers, etc., by Charles H. Culin, James Collins Jones, and others.

PITTSBURGH.—The Refractories Machinery Mfg. Co. recently has been organized with $10,000 capital by J. E. McCloskey Jr., F. H. Atwood and others.

YORK, PA.—A charter has been issued to the York Silica Sand Co., capital $5000, organized by John S. Hauser, A. J. Hershey and C. F. Cooper.

JERSEY CITY, N. J.—The New Jersey Shipbuilding & Dredging Co. has been incorporated with $500,000 to build ships and vessels by E. C. Moore, J. F. Clarke and A. P. Mongolies.

MADISON, N. J.—The Washburn Wire Co., capitalized at $1,000,000, has been organized to make iron, steel and other metals. Albert Palmer, Frank R. Series and George F. Handell are the incorporators.

SUFFOLK, VA.—The Ferguson Mfg. Co. has been incorporated with a capitalization of $50,000 to make agricultural implements. Walter C. Ferguson, George R. Debnam Jr., T. H. Debnam and E. Carl Ferguson are the incorporators.

# Activities in the Central States

CUDAHY, WIS.—The Federal Rubber Co. has awarded a contract to the Leonard Construction Co., McCormick building, Chicago, for a 6-story reinforced concrete factory addition, 50 x 295 feet.

MILWAUKEE.—Klug & Smith, consulting engineers, Mack block, have completed plans for the erection of a foundry addition for the Sivyer Steel Casting Co. at Thirty-seventh avenue and Mitchell street. Another 3-ton electric furnace will be installed, the construction and installation to be done by the company itself.

MILWAUKEE. — The Wadhams Oil Co., 215 First National Bank building, has been granted a permit to build a 2-story office building, 60 x 100 feet, at Clinton and Walker streets, to replace the structures destroyed by fire several months ago.

MILWAUKEE. — The Pan-American Rubber Co., capital $200,000, has been incorporated by Joseph Huebner Sr., Louis E. Fichaux and Joseph Huebner Jr.

WEST ALLIS, WIS. — The Independent Foundry Co. plans to erect a $15,000 foundry addition. Leon M. Curda, 478 Mitchell street, Milwaukee, is architect.

LANSING, MICH. — The Duplex Truck Co., Washtenaw avenue, is building a 2-story factory, 75 x 610 feet.

SAGINAW, MICH.—The Erd Motor Co. is building an addition and having plans prepared for a new plant. B. G. Appleby is president.

AURORA, ILL.—Architect F. M. Barton, 178 West Jackson boulevard, Chicago, is preparing plans for a manufacturing plant to be three stories high, 94 x 291 feet. The owner's name is withheld.

## Government Inquiries

*The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., is in the market for the following machine tools:*

Two 16-inch motor-driven geared-head tool-room lathes, 1322, no date, Philadelphia.

One motor-driven, back-geared turret lathe, 1322, no date, Philadelphia.

One duplex control horizontal boring, drilling and milling machine, 1322, no date, Philadelphia.

One motor-driven grinder, 1322, no date, Philadelphia.

One motor-driven vertical spindle milling machine, 1322, no date, Philadelphia.

One reversing-motor-drive, 60-inch x 60-inch x 12-foot 4-head planer.

*Schedule numbers and place of delivery follow the specifications of the tools. Further information may be had on application from the Navy Department, Bureau of Supplies and Accounts.*

CHICAGO.—The Krom Nick Gear Co. has been organized with $50,000 capital by C. T. Murray and Edward M. O'Brien, 1130 East Forty-sixth street.

CHICAGO.—The Illinois Engineering Co. has acquired a site at Racine avenue and Twenty-first street on which it plans to erect a 1-story, 100 x 118-foot reinforced concrete building. The company manufactures vacuum heating material and steam specialties for power plants.

CHICAGO.—The Electrical Steel Co., 3100 South Wood street, has placed contracts for the erection of a 1-story addition to its plant to cost $25,000.

CHICAGO. — The Chicago, Milwaukee & St. Paul railroad plans to build a 60-mile line from Piedmont, Mont., to Dillon, Mont. C. F. Lowith, Chicago, is chief engineer.

CHICAGO.—The Farm Power Equipment Co., a Delaware corporation capitalized at $2,500,000, will make gas engines, tractors, etc. W. R. Donaldson, J. E. Harper and James Aye, Oak Park, Ill., are the incorporators.

CHICAGO.—Curt Teich plans to erect a $30,000, 2-story, 41 x 92-foot factory. Bids will be received by Vitzhum & Teich, 21 West Van Buren street.

CHICAGO.—L. H. Bronson, 842 Kindzei

will take bids soon on a group of 16 2-story buildings to cost $50,000. Foundations are already in place.

KANKAKEE, ILL.—Bids are being received for the construction of a bridge over the Kankakee river. It is estimated that 60 tons of structural steel will be required. F. M. Enos is county superintendent.

QUINCY, ILL.—The Niswander Co. has been incorporated with $7000 capital to manufacture demountable rims by J. L. Niswander, H. L. Bert and F. C. Scholz.

WAUKEGAN, ILL.—The Universal Tractor Co. will build an addition 100 x 750 feet.

BEDFORD, IND.—The Bedford Foundry & Machine Co. will build an addition 50 x 80 feet.

EVANSVILLE, IND.—The Sanitary Specialties Co. has been incorporated with $100,000 capital to manufacture metal devices by Floyd Johnson, B. Johnson and William Scherfflus.

EVANSVILLE, IND. — The Dugger Machine & Auto Co. has been incorporated to manufacture automobile parts with $10,000 capital, by Charles M. Dugger, Harry C. Post and Oscar L. Dugger.

INDIANAPOLIS.—The Britton Carburetor Co. has been incorporated to manufacture automobile accessories with $15,000 capital by Q. G. Noblitt, Carl G. Fisher and C. G. McCutcheon.

KOKOMO, IND.—The Steelhard Mfg. Co. has been incorporated to manufacture machinery and tools with $5000 capital by Thomas Arnold, Lewis Shively and W. H. Arnold.

BELLEFONTAINE, O.—Improvements involving the expenditure of $100,000 have been undertaken by the Big Four railroad at its shops. The improvements include two new boilers, an electric generator and considerable equipment.

CANTON, O. — The United Furnace Co. has completed plans for a ladle house, 55 x 125 feet. George M. Demorest, Dollar Savings & Trust building, Pittsburgh, has been retained as engineer.

CINCINNATI.—The Ideal Concrete Machinery Co., chartered with $140,000 capital, will engage in the manufacture of machinery. N. H. Beckman, Sigmund Rheinstrom, N. Ranschoff, M. Wetzstein and G. B. Hopkins are the incorporators.

CINCINNATI.—The Milnor Electric Co. has been chartered to engage in the manufacture of machinery by L. Y. Milnor, J. P. Milnor, H. Y. Ritchie, H. B. Machoy and M. Jaquish.

CINCINNATI. — The Lunkenheimer Co. contemplates additions to its brass foundry at an early date.

CLEVELAND.—The Portage Light Heat & Power Co. has been incorporated with $50,000 capital by R. H. Jamison, H. A. Hauxhurst, R. Hall, W. R. Daley and J. H. Kellogg.

CLEVELAND.—The Clarke-Kessler Chemical Works has purchased a site for a consideration of about $25,500. Work is said to have been started on the first unit of its chemical unit to cost about $30,000.

COLUMBUS, O. — The Morton Motor Plow Co., R. A. Morton, president, contemplates improvements inclusive of an electric furnace with a daily capacity of 10 tons, or a converter or small open-hearth furnace of the same capacity.

CLEVELAND.—The Simplex Cable Hoist Co. has been incorporated with $10,000 capital to make hoisting machinery by H. C. Quigley, C. Mulcahy and others.

CLEVELAND. — The Fulton Foundry & Machine Co. recently has been organized with $10,000 capital. Harold T. Clark and others are the incorporators.

ELYRIA, O.—The Anderson Mfg. Co., capital $25,000, has been incorporated to make tools and dies by A. G. Anderson, G. D. Nicholas Sr., G. D. Nicholas Jr., and Edward M. Brush.

HAMILTON, O.—The Columbia Machine Tool Co. is building a large brick and steel addition to its plant to be used for the manufacture of machine tools.

HAMILTON, O.—The Hamilton Machine Tool Co. contemplates an addition to its plant at an early date.

street, has had plans prepared for a 75 x 130-foot machine shop.

CHICAGO.—Architects Davidson & Weiss, 53 West Jackson boulevard, are preparing plans for a $125,000, 2-story manufacturing plant.

CHICAGO.—The C. H. Hansen Co., 178 North Clark street, plans to build a $25,000 addition to their factory. The new building will be 50 x 100 feet, three stories high. Bids will be received by Architect C. O. Hansen, 825 North Dearborn street.

CHICAGO.—Architects Davidson & Weiss, 53 West Jackson boulevard, are preparing plans for a 2-story, 120 x 145-foot factory, to cost $50,000.

CHICAGO.—The Ohio Match Co. has acquired property on Ohio street and contemplates the erection of an 8-story reinforced concrete building to cost between $200,000 and $250,000. The new building will be equipped with automatic sprinklers.

CHICAGO.—The Acme Chandelier & Mfg. Co. has been incorporated with $10,000 capital by F. P. Armbruster, F. J. Wegg, and H. W. Dunmore.

DECATUR, ILL.—The Pan-American Motor Co. will build a factory costing $30,000.

# Mississippi to the Rockies

DULUTH.—The city commission has appropriated $45,000 for a 25,000,000-gallon electrically-operated centrifugal pump.

MINNEAPOLIS. — C. W. Lindquist has had plans drawn for a 1-story 32 x 122-foot factory.

ST. PAUL.—The Hydraulic Hoist Mfg. Co., 409 West Franklin street, will build a factory costing $9000.

SHELDON, IOWA.—The Sheldon Gas Co. plans to erect a $30,000, 1-story gas plant. The Western Gas & Construction Co., Ft. Wayne, Ind., is engineer.

SIOUX CITY, IOWA.—The Sioux City Gas & Electric Co., O. W. Henod, assistant engineer, is asking for bids on steel for a $200,000, 50 x 75-foot boiler room and addition.

KANSAS CITY, MO.—The Kansas City Railways Co. will install machinery at its repair shops and build its own cars. A. T. Hunt, consulting engineer, Chicago, is preparing plans.

KANSAS CITY, MO.—The Bolin Metallic Door Co., A. H. Barber, president, has leased a plant which will be equipped for the manufacture of sheet metal doors and window frames.

ST. LOUIS. — The Phillipps Motor Car Co., recently incorporated with $20,000 capital, will build a repair shop and plant for the manufacture of steam and internal combustion engines.

ST. LOUIS.—The Algonite Stone Co., 2900 Chauteau avenue, is taking bids on the substructures for two 186 x 220, 2-story factory buildings. The estimated cost is $40,000.

OWEN, OKLA.—The Atchison, Topeka & Santa Fe railroad plans to build an extension from Ralston, Okla., to Owen, Okla. C. F. W. Felt, Chicago, is chief engineer.

OMAHA, NEBR.—The Omaha Metropolitan water district plans to erect a new pumping station to cost $30,000.

GREELY, COLO.—The city council plans to buy 5000 feet of 20-inch steel water pipe. M. Seaman is superintendent.

GLAD BROOK, WYO.—The city clerk requests bids on 4-inch water pipe for extensions to its waterworks system.

TURKEY, ARIZ.—The Prescott & Phoenix Short Line railroad, recently incorporated with $25,000 capital, plans to build a 50-mile line. F. P. Hervey, 34 Nassau street, New York, is representing the company.

# The Pacific Coast States

NORTH YAKIMA, WASH. — A contract has been awarded to Clifton, Applegate & Toole of Spokane for construction of the Cowiche branch of the Northern Pacific railroad.

SEATTLE.—An ordinance will be introduced in the city council calling for an issue of bonds in the sum of $4,000,000 for construction of a third pipe line and other structures.

SEATTLE.—Mortiz Thompson president of the Centennial Mill Co. announces that a new and more modern plant will be erected soon.

SPOKANE. — Charles Turner and others, owners of the Queen and Seat mines in Stevens county will immediately install another concentrator in the Deer Trail district to cost $6000. About $2000 will be spent for other machinery.

SALEM, OREG. — The Willamette Shipbuilding Co., capital $1,000,000, has filed articles of incorporation. F. B. Jones, W. E. Jones and Mark T. Cady are the incorporators.

SALEM, OREG. — The Marion county court is receiving bids for the construction of a proposed intercounty bridge between Marion and Polk counties, to be of steel and cost $200,000.

# New Trade Publications

ELECTRIC GRINDERS. — Manufactured by the Wonder Grinder Co., Erie, Pa., and embodying several unique features the Wonder grinder is described in a recently issued folder. Novel features of the grinder include a square, and an angle guide, also an adjustable table. The grinder is small and compact and can be easily installed. Any sheet paper abrasive may be used. The electric motor also furnishes power for a small vacuum system which catches and eliminates dirt and dust.

WATTHOUR METERS. — The General Electric Co., Schenectady, N. Y., has issued a new bulletin, No. 46,209, describing its Thomson direct current astatic watthour meters. Two types of meters are covered in the bulletin, one type being intended for switchboard and the other for installations where front connections are suitable. Both types are constructed on the astatic principle, to minimize the effect of external magnetic fields which are commonly encountered when dealing with heavy direct current circuits.

AIR COMPRESSORS.—In its Bulletin No. 27, the Nagle Corliss Engine Works, Erie, Pa., discusses its power and steam driven air compressors. The former type is known as its class A-E and the latter as its class B-E. Simplicity is the keynote in the design of these compressors. The compressors have air cylinders, designed so that the metal is of uniform thickness in order to prevent internal stresses when heated. The steam driven unit has balanced slide valves. Special alloy steel is used for the air cylinder valves. The crank shaft is of forged open-hearth steel.

WELDING APPARATUS.—An 8-page bulletin is being distributed by the Prest-O-Lite Co., Inc., which describes apparatus for oxy-acetylene welding and cutting. Under the title "Selecting Equipment to Suit Requirements," the Prest-O-Lite company shows the proper equipment to be used for certain classes of work. Under the title, "Welding Equipment," blow pipes, blow pipe tips, regulators, (including oxygen and acetylene) and other miscellaneous equipment is described and illustrated. Specification tables and instructions for replacement of extra parts are likewise included in the booklet.

ROLLER BEARINGS.—Roller bearings are described and illustrated in an 8-page bulletin recently distributed by the Hyatt Roller Bearing Co., Newark, N. J. On the inside front cover of the bulletin, an interesting diagrammatic view of a drilling machine is reproduced in which are shown the location of all roller bearings. An idea of the life, necessary lubrication, design and other important factors in the roller bearings may readily be obtained from an exhaustive description accompanying the illustrations. Specifications tables as well as a partial list of users of these bearings are also included in the booklet.

STOKERS. — The Combustion Engineering Corp., New York, is distributing a 24-page bulletin describing stokers. In this type of stoker the coal is fed into a hopper by either hand labor or coal conveying machinery, and conveyed under the hopper by means of a reciprocating sliding bottom of the feed trough, or a retort which runs the full length of the stoker. It is distributed to the sides of the furnace by means of moving bars, which constantly sift it of its ash on dumping trays along the side. The sliding bottom is driven by a steam piston, the cylinder of which is bolted to the stoker frame under the hopper.

ALUMINUM STEEL ALLOY.—A booklet was recently issued by the Acieral Co. of America devoted to acieral, an aluminum steel alloy. This alloy is said to have a specific gravity of 2.82 and a melting point of 1382 degrees Fahr. The hardness in casting is said to be 119 Brinell; tensile strength 30,000 pounds per square inch, with elongation from 0.5 to 5 per cent. Some of the advantages claimed for this alloy are that it flows well in casting, withstands the action of all acids save hydrochloric, resists chemical reagents except solutions of caustic alkalies, and remains unaltered until its critical heating point is reached.

TWIST DRILLS.—A new 240-page catalog describing drills, reamers, sockets, counterbores, mills, screw extractors, arbors, mandrels and other high-speed tools, has just been published by the Cleveland Twist Drill Co., Cleveland. In the tabular specifications and prices, the prices of carbon steel tools is shown in black ink, while that of high-speed tools is shown in red ink. This novel departure from most catalogs, greatly simplifies the table. The catalog which is designated as Catalog 39 is well bound in heavy flexible paper and has a thumb index which aids in finding the various principal divisions of the booklet.

ACETYLENE APPARATUS. — An illustrated bulletin issued by the Oxweld Acetylene Co., Newark, N. J., displays various instances of the application of welding apparatus to modern shop practice and repair work. Pertinent points emphasized are the rapidity with which repairs can be made; the salvage of scrap; the repair of defective castings, and the correction of machine and pattern shop errors. Cuts and descriptions of actual cases of welded broken parts, together with a statement of the cost of welding and the time and money saved are used to demonstrate the need of acetylene apparatus in the modern factory.

GAS PRODUCERS.—A well illustrated 32-page catalog containing descriptions of gas producer plants delivering gas from bituminous coal, is being distributed by the Smith Gas Engineering Co., Lexington, O. The booklet includes in its columns many diagrammatic views of apparatus, reproductions of photographs showing several installations, and blueprint inserts. The description of the apparatus covers the first five pages of the booklet. The shell, lining and other parts of the generator are stationary and the agitation of the fuel bed is accomplished by the movement of grate bars exclusively. The coal is fed by mechanical stokers.

SMALL MOTORS AND GENERATORS.—The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., recently has issued a new catalog describing its small direct and alternating (both single and polyphase) current motors and generators suitable for general application where amounts of power less than 1 horsepower are required. The alternating-current motors are supplied in various styles and are built either with or without clutches. A large range of types of direct-current motors are also described. Considerable data is included in the booklet which gives the overall size of the frames, the adjustment features of the pedestals, shipping weights and the necessary operating information.

STEEL HARDENING PROCESS.—A catalog lately circulated by the Stroh Steel-Hardening Process Co., Pittsburgh, states the theory of the steel hardening process employed by that company. The statement is made that the actual amount of steel subjected to wear in any given casting is small; generally less than 10 per cent of the total weight of the casting. Consequently the use of hard material for the weight—or stress—supporting part of the casting is unnecessary. Cuts of rolling mill gears, spindles, pinions, frogs, crossings and inserts for railroad work, illutrate instances in which Stroh process castings are said to have given superior service at a minimum cost.

STEEL EXPORTS.—"America's entrance into the vast field of export engineering and contracting marks an epoch in her overseas trade development," says the American Steel Export Co., 233 Broadway, New York, in connection with the distribution of a booklet descriptive of the service it offers. For centuries France, Germany and England have done the mechanical upbuilding of new continents as they came into commercial life. At the same time, however, it is stated there has not been available to Asia, Africa, South America or even to Europe itself an organization capable of rendering a complete and effective export engineering service. The booklet describes the organization and facilities at the command of the American Steel Export Company.

DIES AND DIE HOLDERS.—A catalog issued by the Greenfield Tap & Die Corp., Greenfield, Mass., describes Acorn dies and die holders, Acorn releasing holders and Acorn die adapters. A special alloy steel is employed in making the die; the necessary radial movement of the lands is assisted by thinning the section immediately back of the thread, however, the width of these prongs is increased for the purpose of stiffness; the base of the die and its seat are ground flat and true. The adjusting cap fits over the die and is threaded on to the body below the die seat. It is of ample size, locked in position and slotted to permit the exit of chips. Advantages of the Acorn die and die holder are enumerated and adjustment and grinding direction given. Specifications of the different types of dies and die holders are appended.

METAL SHEET TESTING MACHINES. —The Erichsen type of machine for testing metal sheets which was developed in Norway and now has been placed on the market in this country by Herman A. Holz, 50 Church street, New York, is described in a booklet just issued by Mr. Holz. In this machine, a specimen of the sheet or strip is clamped between two dies and so held that the metal can "flow" while a tool with a rounded end is moved gradually forward under the influence of a ram, actuated by a micrometer screw, until fracture occurs. The test sheet is under permanent observation of the operator so that the point of fracture can be determined with great accuracy. The depth of impression required to obtain fracture may be read directly from the micrometer scale and is said accurately to indicate the drawing, stamping, compressive and folding qualities of the specimen.

# Iron and Steel Prices

Corrected to Tuesday noon

## IRON ORE

Superior Ores, Per Ton, Lower Lake Ports.

| | |
|---|---|
| Old range Bessemer, 55 iron | 5.95 |
| Mesabi Bessemer, 55 iron | 5.70 |
| Old range non-Bess., 51½ iron | 5.20 |
| Mesabi non-Bess., 51½ iron | 5.05 |

Port Henry Ores, non-Bessemer, Per Unit, Delivered Eastern Pennsylvania.

| | |
|---|---|
| Old Bed, crude 55 iron | 10.50c to 11.00c |
| Old Bed., concent., 65 iron | 11.00c to 11.50c |
| Harmony, concent., 63 iron | 11.50c to 11.75c |
| Lump (at mines) | $5.75 |

## WAREHOUSE PRICES

| | |
|---|---|
| Steel bars, Chicago | 4.50c |
| Steel bars, Cleveland | 5.00c |
| Steel bars, Detroit | 4.50c |
| Steel bars, Philadelphia | 5.00c to 5.50c |
| Steel bars, New York | 5.00c |
| Steel bars, St. Louis | 4.55c |
| Steel bars, Cincinnati | 4.65c |
| Steel bars, St. Paul | 4.60c |
| Steel bars, Buffalo | 4.60c to 5.10c |
| Iron bars, Chicago | 4.50c |
| Iron bars, Cleveland | 4.95c |
| Iron bars, Detroit | 4.50c |
| Iron bars, St. Louis | 4.45c |
| Iron bars, Cincinnati | 4.65c |
| Iron bars, Philadelphia | 5.00c |
| Iron bars, New York | 5.00c |
| Shapes, Chicago | 5.00c |
| Shapes, Detroit | 5.00c |
| Shapes, St. Louis | 5.05c |
| Shapes, St. Paul | 5.10c |
| Shapes, New York | 5.25c |
| Shapes, Cleveland | 5.25c |
| Shapes, Philadelphia | 5.00c to 5.50c |
| Shapes, Buffalo | 5.10c to 5.35c |
| Shapes, Cincinnati | 5.00c |
| Plates, Chicago | 8.00c |
| Plates, Detroit | 8.00c |
| Plates, St. Louis | 7.05c to 7.55c |
| Plates, St. Paul | 7.10c |
| Plates, New York | 9.00c |
| Plates, Cleveland | 7.50c |
| Plates, Philadelphia | 9.50c to 10.00c |
| Plates, Cincinnati | 9.00c |
| No. 10 blue anl. sheets, Chi. | 9.50c |
| No. 10 blue anl. sheets, Cleve. | 9.50c |
| No. 10 blue anl., Buffalo | 11.00c to 11.75c |
| No. 10 blue anl. sheets, St. L. | 9.55c |
| No. 10 blue anl. sheets, Cinci. | 9.50c |
| No. 10 blue anl. sheets, St. Paul | 9.60c |
| No. 10 blue annealed, Detroit | 8.00c |
| No. 28 black sheets, Chicago | 9.50c |
| No. 28 black sheets, Cleve. | 9.50c |
| No. 28 black sheets, Cincin. | 8.15c |
| No. 28 black, Detroit | 8.00c |
| No. 28 black sheets, St. L. | 9.85c |
| No. 28 black sheets, St. Paul | 9.60c |
| No. 28 galv. sheets, Chicago | 11.00c |
| No. 28 galv. sheets, Cleve. | 11.00c |
| No. 28 galv. sheets, Cincin. | 10.15c |
| No. 28 galvanized, Detroit | 11.00c |
| No. 28 galv. sheets, St. L. | 11.25c |
| Hoops, Cleveland | 6.00c |
| Hoops, Detroit | 6.00c |

## IRON AND STEEL SCRAP

### STEEL WORKS USE

(Gross Tons)

| | |
|---|---|
| Bundled sheets, Pittsburgh | $29.00 to 30.00 |
| Bundled sheets, Cleveland | 25.00 to 27.00 |
| Bundled sheets, Buffalo | 22.00 to 23.00 |
| City wrought, short, N. Y. | 35.00 |
| Frogs, switches, guards, St. L. | 37.00 to 38.00 |
| Heavy melting steel, Pitts. | 43.00 to 45.00 |
| Heavy melting steel, Buffalo | 38.00 to 39.00 |
| Heavy melting steel, Chgo. | 37.50 to 40.50 |
| Heavy melt'g steel, Cleveland | 40.00 to 41.00 |
| Heavy melting steel, Cinci. | 37.50 to 38.00 |
| Heavy melting steel, east. Pa. | 37.50 to 38.50 |
| Heavy melt'g steel N. Y. | 35.00 to 36.00 |
| Heavy melting steel, St. L. | 39.00 to 40.00 |
| Heavy melt'g steel, Birming. | 24.00 to 26.00 |
| Hydraulic pressed sh'ts, Cleve. | 36.00 to 37.00 |
| Hydraulic press. sheets, Pitts. | 35.00 |
| Hydraulic pressed sh'ts, Chgo. | 29.00 to 29.50 |
| Low phos. steel, Buffalo | 55.00 to 60.00 |
| Low phos. steel, Pittsburgh | 55.00 to 58.00 |
| Low phos. steel, eastern Pa. | 56.00 to 58.00 |
| Shoveling steel, Chgo. | 34.50 to 36.00 |
| Shoveling steel, St. Louis | 36.00 to 36.50 |
| Steel rails, short, Chicago | 48.00 to 49.00 |
| Steel rails, short, Cleveland | 46.00 to 47.00 |
| Steel rails, short, St. Louis | 41.00 to 42.00 |
| Steel rails, old, Birmingham | 30.00 to 31.00 |
| Stove plate, Cincinnati | 19.75 to 20.00 |
| Stove plate, St. Louis | 20.00 to 21.00 |
| Stove plates, N. J. points | 22.00 |
| Stove plate, Birmingham | 18.00 to 19.00 |
| Stove plate, Buffalo | 23.00 to 24.00 |
| Stove plate, eastern Pa. | 23.00 to 24.00 |
| Stove plate, Pittsburgh | 25.00 |

### (Net Tons)

| | |
|---|---|
| Boiler plate, cut, No. 1, Chgo. | 24.75 to 25.25 |
| Boiler plate, cut, No. 1, St. L. | 23.00 to 24.00 |
| Bundled sheet, Cincinnati | 23.00 to 23.50 |
| Knuckles, coup., Chicago | 42.00 to 43.00 |
| Knuckles, coup., St. Louis | 34.00 to 35.00 |
| Springs, Chicago | 43.00 to 44.00 |
| Stove plate, Chicago | 21.50 to 22.50 |
| Stove plate, Cleveland | 21.50 to 22.50 |

## Freight Rates, Pig Iron

| | |
|---|---|
| Mahoning and Shenango valleys to: | |
| Cleveland | $0.95 |
| Newark, N. J. | 2.98 |
| Boston | 3.18 |
| Philadelphia | 2.78 |
| Pittsburgh | .95 |
| St. Louis | 3.18 |
| Minneapolis, St. Paul | 4.54 |
| Buffalo to: | |
| Albany, N. Y. | $1.26 |
| New England (rail) | 2.58 |
| New York and Brooklyn (rail) | 2.58 |
| Virginia furnaces to: | |
| Boston docks (r. and w.) | $3.05 |
| New England (all rail) | 3.25 |
| New York dock (r. and w.) | 2.88 |
| Birmingham, Ala., to: | |
| Cincinnati | $2.90 |
| Chicago | 4.00 |
| Cleveland | 4.00 |
| Louisville, Ky. | 2.65 |
| Minneapolis, St. Paul | 5.85 |
| New York (r. and w.) | 4.25 |
| Philadelphia (r. and w.) | 4.00 |
| Pittsburgh | 4.90 |
| Savannah, Ga. | 2.75 |
| St. Louis | 3.40 |
| Chicago to: | |
| Des Moines | $2.80 |
| Milwaukee | .50 |
| Minneapolis, St. Paul | 2.00 |
| Moline, Ill. | 1.40 |
| Omaha | 3.58 |
| St. Louis | 1.58 |
| Ironton and Jackson, O., to: | |
| Chicago | $2.54 |
| Cincinnati | 1.26 |
| Cleveland | 1.62 |
| Detroit | 1.81 |
| Indianapolis | 1.58 |
| Minneapolis, St. Paul | 4.54 |
| Duluth, Minn., to: | |
| Minneapolis-St. Paul | $1.25 |
| Mayville, Wis.: | |
| Minneapolis-St. Paul | $1.75 |

## Freight Rates, Finished Material

| | |
|---|---|
| Pittsburgh, carloads, per 100 lbs., to: | |
| New York | 16.9 cents |
| Philadelphia | 15.9 cents |
| Boston | 18.9 cents |
| Buffalo | 11.6 cents |
| Baltimore | 15.4 cents |
| Cleveland | 10.5 cents |
| Cincinnati | 15.8 cents |
| Chicago | 18.9 cents |
| Detroit | 15.7 cents |
| Minneapolis and St. Paul | 32.9 cents |
| Denver | 83.6 cents |
| St. Louis | 23.6 cents |
| New Orleans | 30 cents |
| Birmingham | 45 cents |
| Pacific coast (all rail) | 73.9 cents |
| Pacific coast (tin plate) | 70 cents |
| Pacific coast, via Panama | 61.0 cents |

### IRON MILL USE

(Gross Tons)

| | |
|---|---|
| Busheling No. 1, Buffalo | 33.00 to 34.00 |
| Busheling, No. 2, Buffalo | 21.00 to 22.00 |
| Busheling, No. 1, Pittsburgh | 27.00 to 28.00 |
| Cast borings, New York | 21.50 to 22.00 |
| Cast borings, eastern Pa. | 22.00 to 22.50 |
| Cast borings, Buffalo | 21.00 to 22.00 |
| Cast borings, Pittsburgh | 23.00 to 25.00 |
| City wrgt., long, New York | 40.00 |
| Forge flashings, small, Cleve. | 35.00 to 36.00 |
| Forge flashings, large, Cleve. | 31.50 to 32.50 |
| Forge, No. 1, eastern Pa. | 26.00 to 28.00 |
| Grate bars, Buffalo | 23.00 to 24.00 |
| Grate bars, N. J. points | 20.00 |
| Iron axles, Pittsburgh | 55.00 to 60.00 |
| Iron axles, Cincinnati | 46.00 to 46.50 |
| Iron axles, eastern Pa. | 50.00 to 55.00 |
| Iron axles, Buffalo | 55.00 to 60.00 |
| Iron rails, Chicago | 46.00 to 47.00 |
| Iron rails, Buffalo | 45.00 to 46.00 |
| Iron rails, Cincinnati | 36.00 to 36.50 |
| Iron rails, St. Louis | 45.00 to 46.00 |
| Iron rails, Cleveland | 50.00 to 51.00 |
| Machine turnings, Buffalo | $21.00 to 22.00 |
| Machine shop turnings, N. Y. | 20.00 |
| Mach. shop turnings, Pitts. | 23.50 to 25.00 |
| Mch. shop turnings, east. Pa. | 21.50 to 22.00 |
| Machine turnings, Birming. | 15.00 to 16.00 |
| R. R., mch. cast, No. 1, Buff. | 32.00 to 33.00 |
| R. R. wrought, 1, Buffalo | 50.00 to 55.00 |
| R. R wrgt., No. 1, east. Pa. | 55.00 to 60.00 |
| R. R. wrought, No. 1, Pitts. | 43.00 to 45.00 |
| R. R. wrought, 1, B'ham | 34.00 to 35.00 |
| Wrought pipe, Buffalo | 35.00 to 36.00 |
| Wrought pipe, eastern Pa. | 39.00 to 40.00 |
| Wrought pipe, New York | 38.00 |

### (Net Tons)

| | |
|---|---|
| Angle bars, iron, Chicago | $44.00 to 45.00 |
| Angle bars, steel, St. Louis | 34.00 to 34.50 |
| Arch bars & transoms, St. L. | 41.00 to 42.00 |
| Arch bars & transoms, Chgo. | 47.00 to 48.00 |
| Busheling, No. 1, Chicago | 31.00 to 32.00 |
| Busheling, No. 1, Cincinnati | 22.00 to 22.50 |
| Busheling, No. 1, Cleveland | 32.00 to 33.00 |
| Busheling, No. 1, St. Louis | 27.50 to 28.50 |
| Busheling, No. 2, Chicago | 22.00 to 23.00 |
| Cast borings, Cincinnati | 14.00 to 14.50 |
| Cast borings, Cleveland | 21.00 to 22.00 |
| Cast borings, St. Louis | 16.50 to 17.50 |
| Cast borings, Chicago | 18.50 to 19.00 |
| Cut forge, Chicago | 37.50 to 38.50 |
| Grate bars, Cleveland | 23.50 to 24.50 |
| Iron axles, St. Louis | 49.00 to 50.00 |
| Iron axles, Chicago | 50.00 to 51.00 |
| Iron axles, Cleveland | 52.00 to 53.00 |
| Machine shop turnings, Chgo. | 19.00 to 20.00 |
| Mach. shop turnings, Cleve. | 19.50 to 20.00 |
| Machine shop turn'gs, Cinci. | 14.00 to 14.50 |
| Mach. shop turnings, St. L. | 18.00 to 19.00 |
| Pipes and flues, Cleveland | 28.00 to 29.00 |
| Pipes and flues, Chicago | 28.00 to 29.00 |
| Pipes and flues, St. Louis | 24.00 to 25.00 |
| Railroad wrought, 1, Cleve. | 48.00 to 49.00 |
| Railroad wrgt., No. 1, Chgo. | 40.00 to 41.00 |
| Railroad wrought, 1, Cinci. | 36.00 to 36.50 |
| Railroad wrought, 1, St. L. | 39.00 to 40.00 |
| Railroad wrgt., No. 2, Chgo. | 37.50 to 38.50 |
| Railroad wrought, 2, St. L. | 37.00 to 38.00 |

### IRON OR STEEL WORKS USE

(Gross Tons)

| | |
|---|---|
| Axle turnings, Cleveland | $27.00 to 28.00 |
| Axle turnings, Buffalo | 28.00 to 29.00 |
| Shafting, New York | 50.00 |
| Shafting, eastern Pa. | 50.00 to 55.00 |
| Steel car axles, Birmingham | 40.00 to 41.00 |
| Steel car axles, New York | 58.00 |
| Steel car axles, Buffalo | 55.00 to 60.00 |
| Steel car axles, Cleveland | 54.00 to 55.00 |
| Steel car axles, Pittsburgh | 55.00 to 60.00 |
| Steel car axles, eastern Pa. | 50.00 to 55.00 |

### (Net Tons)

| | |
|---|---|
| Shafting, St. Louis | 37.00 to 39.00 |
| Steel car axles, St. Louis | 49.00 to 50.00 |
| Steel car axles, Chicago | 49.00 to 50.00 |

### IRON FOUNDRY USE

(Gross Tons)

| | |
|---|---|
| Car wheels, (iron), Pitts. | $42.00 to 45.00 |
| Car wheels, (steel), Pitts. | 50.00 |
| Car wheels, Chicago | 38.00 to 39.00 |
| Car wheels, eastern Pa. | 40.00 |
| Car wheels, Buffalo | 38.00 to 40.00 |
| Car wheels, New York | 33.00 to 35.00 |
| Car wheels, St. Louis | 36.00 to 36.50 |
| Car wheels, Birmingham | 30.00 to 31.00 |
| Car wheels, Cleveland | 36.00 to 37.00 |
| Tram car wheels, Birming. | 27.00 to 28.00 |
| Cast, 1, heavy, N. J. points. | 35.00 |
| Cast, 1 machy., N. J. points | 40.00 |
| Cast, No. 1, eastern Pa. | 39.00 to 41.00 |
| Cast, No. 1, Pittsburgh | 34.00 to 37.00 |
| Cast, No. 1, Birmingham | 30.00 to 31.00 |
| Malleable railroad, Cincinnati | 21.50 to 22.00 |
| Malleable railroad, Cleveland | 42.00 to 43.00 |
| Malleable railroad, Buffalo | 35.00 to 36.00 |
| Malleable railroad, Pittsburgh | 30.00 to 32.00 |
| Malleable railroad, east. Pa. | 32.00 to 34.00 |

### (Net Tons)

| | |
|---|---|
| Cast No. 1, Cleveland | 34.00 to 34.50 |
| Cast, No. 1, Chicago | 31.00 to 32.00 |
| Cast, No. 1, Cincinnati | 29.00 to 29.50 |
| Cast, No. 1, St. Louis | 28.00 to 29.00 |
| Malleable railroad, Chicago | 34.00 to 35.00 |
| Malleable railroad, St. Louis | 27.00 to 28.00 |
| Malleable agricultural, Chgo. | 27.50 to 28.50 |

### MISCELLANEOUS USES

(Gross Tons)

| | |
|---|---|
| Reroll. rails, 5 ft. & ov., Pitts. | 50.00 to 55.00 |
| Reroll. rails, 5 ft. & ov., Chgo. | 47.50 to 48.50 |
| Reroll. rails, 5 ft. & ov., E. Pa. | 50.00 to 55.00 |
| Reroll. rails, 5 ft. & ov., St. L. | 47.00 to 48.00 |
| Reroll. rails, 5 ft. or ov., Cleve. | 50.00 to 51.00 |
| Rerolling rails, long, Birming. | 40.00 to 41.00 |

(Net Tons)

| | |
|---|---|
| Boiler punchings, Chicago | 37.00 to 38.00 |
| Locomotive tires, Chicago | 50.00 to 51.00 |
| Locomotive tires, St. Louis | 45.00 to 46.00 |

# New Trade Publications

ELECTRIC GRINDERS. — Manufactured by the Wonder Grinder Co., Erie, Pa., and embodying several unique features the Wonder grinder is described in a recently issued folder. Novel features of the grinder include a square, and an angle guide, also an adjustable table. The grinder is small and compact and can be easily installed. Any sheet paper abrasive may be used. The electric motor also furnishes power for a small vacuum system which catches and eliminates dirt and dust.

WATTHOUR METERS. — The General Electric Co., Schenectady, N. Y., has issued a new bulletin, No. 46,209, describing its Thomson direct current astatic watthour meters. Two types of meters are covered in the bulletin, one type being intended for switchboard and the other for installations where front connections are suitable. Both types are constructed on the astatic principle, to minimize the effect of external magnetic fields which are commonly encountered when dealing with heavy direct current circuits.

AIR COMPRESSORS.—In its Bulletin No. 27, the Nagle Corliss Engine Works, Erie, Pa., discusses its power and steam driven air compressors. The former type is known as its class A-E and the latter as its class B-E. Simplicity is the keynote in the design of these compressors. The compressors have air cylinders, designed so that the metal is of uniform thickness in order to prevent internal stresses when heated. The steam driven unit has balanced slide valves. Special alloy steel is used for the air cylinder valves. The crank shaft is of forged open-hearth steel.

WELDING APPARATUS.—An 8-page bulletin is being distributed by the Prest-O-Lite Co., Inc., which describes apparatus for oxy-acetylene welding and cutting. Under the title "Selecting Equipment to Suit Requirements," the Prest-O-Lite company shows the proper equipment to be used for certain classes of work. Under the title, "Welding Equipment," blow pipes, blow pipe tips, regulators, (including oxygen and acetylene) and other miscellaneous equipment is described and illustrated. Specification tables and instructions for replacement of extra parts are likewise included in the booklet.

ROLLER BEARINGS.—Roller bearings are described and illustrated in an 8-page bulletin recently distributed by the Hyatt Roller Bearing Co., Newark, N. J. On the inside front cover of the bulletin, an interesting diagrammatic view of a drilling machine is reproduced in which are shown the location of all roller bearings. An idea of the life, necessary lubrication, design and other important factors in the roller bearings may readily be obtained from an exhaustive description accompanying the illustrations. Specifications tables as well as a partial list of users of these bearings are also included in the booklet.

STOKERS. — The Combustion Engineering Corp., New York, is distributing a 24-page bulletin describing stokers. In this type of stoker the coal is fed into a hopper by either hand labor or coal conveying machinery, and conveyed under the hopper by means of a reciprocating sliding bottom of the feed trough, or a retort which runs the full length of the stoker. It is distributed to the sides of the furnace by means of moving bars, which constantly sift it of its ash on dumping trays along the side. The sliding bottom is driven by a steam piston, the cylinder of which is bolted to the stoker frame under the hopper.

ALUMINUM STEEL ALLOY.—A booklet was recently issued by the Acieral Co. of America devoted to acieral, an aluminum steel alloy. This alloy is said to have a specific gravity of 2.82 and a melting point of 1382 degrees Fahr. The hardness in casting is said to be 119 Brinell; tensile strength 30,000 pounds per square inch, with elongation from 0.5 to 5 per cent. Some of the advantages claimed for this alloy are that it flows well in casting, withstands the action of all acids save hydrochloric, resists chemical reagents except solutions of caustic alkalies, and remains unaltered until its critical heating point is reached.

TWIST DRILLS.—A new 240-page catalog describing drills, reamers, sockets, counterbores, mills, screw extractors, arbors, mandrels and other high-speed tools, has just been published by the Cleveland Twist Drill Co., Cleveland. In the tabular specifications and prices, the prices of carbon steel tools is shown in black ink, while that of high-speed tools is shown in red ink. This novel departure from most catalogs, greatly simplifies the table. The catalog which is designated as Catalog 39 is well bound in heavy flexible paper and has a thumb index which aids in finding the various principal divisions of the booklet.

ACETYLENE APPARATUS. — An illustrated bulletin issued by the Oxweld Acetylene Co., Newark, N. J., displays various instances of the application of welding apparatus to modern shop practice and repair work. Pertinent points emphasized are the rapidity with which repairs can be made; the salvage of scrap; the repair of defective castings, and the correction of machine and pattern shop errors. Cuts and descriptions of actual cases of welded broken parts, together with a statement of the cost of welding and the time and money saved are used to demonstrate the need of acetylene apparatus in the modern factory.

GAS PRODUCERS.—A well illustrated 32-page catalog containing descriptions of gas producer plants delivering gas from bituminous coal, is being distributed by the Smith Gas Engineering Co., Lexington, O. The booklet includes in its columns many diagrammatic views of apparatus, reproductions of photographs showing several installations, and blueprint inserts. The description of the apparatus covers the first five pages of the booklet. The shell, lining and other parts of the generator are stationary and the agitation of the fuel bed is accomplished by the movement of grate bars exclusively. The coal is fed by mechanical stokers.

SMALL MOTORS AND GENERATORS.—The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., recently has issued a new catalog describing its small direct and alternating (both single and polyphase) current motors and generators suitable for general application where amounts of power less than 1 horsepower are required. The alternating-current motors are supplied in various styles and are built either with or without clutches. A large range of types of direct-current motors are also described. Considerable data is included in the booklet which gives the overall size of the frames, the adjustment features of the pedestals, shipping weights and the necessary operating information.

STEEL HARDENING PROCESS.—A catalog lately circulated by the Stroh Steel-Hardening Process Co., Pittsburgh, states the theory of the steel hardening process employed by that company. The statement is made that the actual amount of steel subjected to wear in any given casting is small; generally less than 10 per cent of the total weight of the casting. Consequently the use of hard material for the weight—or stress—supporting part of the casting is unnecessary. Cuts of rolling mill gears, spindles, pinions, frogs, crossings and inserts for railroad work, illutrate instances in which Stroh process castings are said to have given superior service at a minimum cost.

STEEL EXPORTS.—"America's entrance into the vast field of export engineering and contracting marks an epoch in her overseas trade development," says the American Steel Export Co., 233 Broadway, New York, in connection with the distribution of a booklet descriptive of the service it offers. For centuries France, Germany and England have done the mechanical upbuilding of new continents as they came into commercial life. At the same time, however, it is stated there has not been available to Asia, Africa, South America or even to Europe itself an organization capable of rendering a complete and effective export engineering service. The booklet describes the organization and facilities at the command of the American Steel Export Company.

DIES AND DIE HOLDERS.—A catalog issued by the Greenfield Tap & Die Corp., Greenfield, Mass., describes Acorn dies and die holders, Acorn releasing holders and Acorn die adapters. A special alloy steel is employed in making the die; the necessary radial movement of the lands is assisted by thinning the section immediately back of the thread, however, the width of these prongs is increased for the purpose of stiffness; the base of the die and its seat are ground flat and true. The adjusting cap fits over the die and is threaded on to the body below the die seat. It is of ample size, locked in position and slotted to permit the exit of chips. Advantages of the Acorn die and die holder are enumerated and adjustment and grinding direction given. Specifications of the different types of dies and die holders are appended.

METAL SHEET TESTING MACHINES. —The Erichsen type of machine for testing metal sheets which was developed in Norway and now has been placed on the market in this country by Herman A. Holz, 50 Church street, New York, is described in a booklet just issued by Mr. Holz. In this machine, a specimen of the sheet or strip is clamped between two dies and so held that the metal can "flow" while a tool with a rounded end is moved gradually forward under the influence of a ram, actuated by a micrometer screw, until fracture occurs. The test sheet is under permanent observation of the operator so that the point of fracture can be determined with great accuracy. The depth of impression required to obtain fracture may be read directly from the micrometer scale and is said accurately to indicate the drawing, stamping, compressive and folding qualities of the specimen.